A Changing Paradigm? Measuring Urban Decentralization through the Great Recession

An Applied Research Paper

Laura Schultz

Advised by Dr. Daniel Immergluck
Georgia Institute of Technology
College of Architecture | Master's of City and Regional Planning
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ABSTRACT

In the early 2000's leading up to the Great Recession of 2007, many in-town and urban neighborhoods across the United States began to experience somewhat of a renaissance. Residential development in central cities and core suburbs as a share of regional construction had been greater than previous decades (EPA, 2010). With the onset of the recession, residential building and settling trends were turned upside down. The purpose of this research is to examine the residential development trends during and after the economic recession (mid-2007 until early 2010) in order to understand if development centralized, decentralized, or remained the same. Specifically, the research measures how population, housing, vacancy, and occupancy rates have fared within the core and beyond the core of Metropolitan Statistical Area's (MSA) across the U.S.

To have a better understanding of how this development has changed over time, data was obtained for three points in time: 2000, mid-2007, and 2010. The following cities were analyzed: Dallas, TX, Denver, CO, Birmingham, AL, Baltimore, MD, Minneapolis, MN, Seattle, WA, Sacramento, CA, Los Angeles, CA, New York, NY, Miami, FL, Philadelphia, PA, and Kansas City, MO. This study finds that during the recession all cities decentralized. For New York and Birmingham, there was an overall reversal in trends from centralization to decentralization. Five cities continued to decentralize as before, but this rate slowed from the previous period. These cities included Baltimore, Denver, Minneapolis, Philadelphia, and Seattle. Lastly, the five remaining cities continued to decentralize but experienced accelerated decentralization through the recession. This included Miami, Dallas, Kansas City, Los Angeles, and Sacramento. The findings of this research go against the claims of many commentators and academics that the economic recession has bought about a paradigm shift in building to high-density, centralized urban living.

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I. Introduction

After World War II, cities across the United States experienced depopulation and a draining of economic investment within central cities as the middle class began to move to suburbs beyond city limits. While some revitalization of inner city neighborhoods and gentrification began to occur in the 1970's and 1980's, sprawling development patterns largely continued through the 1990's (Myers, D., & Pitkin, J., 2009). In the late 1990's, infill development arose as a strategy to combat sprawl through densification, conservation of agricultural lands, leveraging of economic investment, and the creation of positive social externalities across a more contiguous urban fabric (Burchell, 2003; Felt, 2007). Derived from the New Urbanism and Smart Growth movements, the redevelopment and reuse of urban land coincided with the promotion of a more compact, mixed-use, pedestrian oriented and sustainable urban form (Congress for New Urbanism, 2001). The effects of infill development have been seen in downtown revitalizations throughout the past decade. Specifically, leading up to 2008, development in central cities and core suburbs as a share of regional construction has been much greater than previous decades with 26 cities doubling or tripling their share of their regions' residential building permits from 1990 to 2008 (EPA, 2010).

With the onset of the Great Recession in 2007, development patterns across the nation were turned upside down. While revival of urban centers and the desire for an urban lifestyle was gaining ground already, many academics point to the foreclosure and economic crises as helping to accelerate a fundamental transition of the housing market to more compact, smaller lot, higher density development (Duhnam-Jones & Williamson, 2011; Kemp, 2011; Leinberger, 2008; Meyers & Pitkin, 2009; Volk & Zimmerman, 2011). It is unclear, however, how resilient urban infill trends and the development of urban cores across the nation have been to the Great Recession.

The purpose of this research is to examine the residential development trends during and after the economic recession (mid-2007 until early 2010) in order to understand if development centralized, decentralized, or remained the same. Through the use of decennial census data and the American Communities Survey, the study examines whether population, housing units, occupied units, and vacant units moved toward the urban core, defined as within 3 miles from the place boundary of each city or if these variables moved away from the urban core or the non-core. The non-core is defined as between 3 miles of the urban core and the MSA boundary.

Section II of the paper includes a literature review, which describes previous literature on the nature of infill development, associated benefits and challenges, and a more in depth look at development trends in the U.S. since the 1990's. In addition, the effects of the Great Recession on housing markets, construction, and development are discussed. Section III describes the data sources used and the methodology when selecting cities and determining centralization trends. Section IV details the results of each city for the variables analyzed as well as the indicators of centralization used. Lastly, Section V concludes the report, summarizing the results and providing implications for future policy and research.

II. Literature Review

Compact Development versus Sprawl

Density is a defining characteristic of urban form, influencing the spatial pattern of human activities within the built environment (Anderson, 1996). Compact urban form is commonly described as high-density concentrated development, composed of a mixture of land uses, including employment and housing (Tsai, 2005). Galster et al. (2001) describe compactness as the degree to which development is clustered and minimizes the amount of land developed in each square mile. Densification is most simply the process of increasing the compactness of existing neighborhoods where population grows faster than land development for urbanization (Fulton, 2001; Jaret et al., 2009). Densification is also understood as becoming better organized, increasing shared space while decreasing private space, and optimizing supply chains for environmental and social efficiency (Soloman, 2008). Dense urban environments have vast implications on the mechanics of a city, dictating the viability of mass transit, amenities and businesses as well as the vitality and energy of the street and public spaces (Rybzczynski, 2011, Jacobs, 1961).

Urban sprawl has no agreed upon definition, however common themes emerge in the literature including scattered development, low-density, and leap frog development characterized by strip form at the periphery of metropolitan areas (Ewing, 1997; Burchell, 2003; Tsai, 2005). Sprawl is also characterized as rapid and significant development in both rural and undeveloped areas (Burchell, 2003). Numerous models have been developed to attempt to measure the level of compactness of development. The literature indicates there are various dimensions used to measure sprawl including metropolitan size, density as land consumption per capita, unequal distribution, proximity, centrality, nuclearity, continuity, and accessibility (Galster et al., 2001; Ewing, 2002; Tsai, 2005, Cutsinger et al., 2005).

Infill Development

Definition and Rationale

Infill development continues to have no agreed upon or standardized definition. At its broadest definition, infill development is any development occurring within the boundaries of a metropolitan areas' central city (McConnel & Wiley, 2010). Combining summaries from 23 authors, institutions, and localities, the Center for Urban Policy Research (2006) defines infill development as a "broad array of development (residential and nonresidential; new construction, reuse, and rehabilitation; and modest and larger scale) occurring on scattered sites in largely developed areas." Infill development as a strategy for urban development is derived from the New Urbanism and Smart Growth movements of the early 1990's, both of which promote a more compact, mixed-use, pedestrian oriented and sustainable urban form (Congress for New Urbanism, 2001). Such movements call for urban infill as a densification strategy, which helps to conserve agricultural lands, leverage economic investment, and create positive social externalities across a more contiguous urban fabric (Burchell, 2003; Felt, 2007) The utilization of existing infrastructure such as roads, transit, and parks and existing services such as police, fire, and schools are associated benefits for local governments (Center for Urban Policy Research, 2006).

Challenges

While infill and densification strategies are desirable on many accounts, urban areas and inner-city neighborhoods prove to be a challenging environment for development. Local policy can act to deter infill such as restrictive zoning and subdivision requirements. Policymakers often lack insight into public costs savings and are concerned with the costs of rising demand for local services (Bragado, 1995; McConnel & Wiley, 2010). Construction may also prove more difficult as existing sites are subject to development constraints pertaining to size, land assembly, cost, infrastructure, and environmental contamination (Municipal Research and Services Center, 1997). Each of these can drive up development costs ultimately affecting the readiness of lenders to finance what is often seen as a riskier project (McConnel & Wiley, 2010). Lastly, Ferris (2001) discusses the political challenges due to coordination with many nearby property owners and parties of interest, complexities of public-private partnerships involved, and the common Not-In-My-Back-Yard (NIMBY) feelings towards higher density development.

Policies pertaining to Infill

Public policy at the local, state, and federal level has begun to promote infill and compact development in metropolitan areas. Despite ongoing challenges, localities across the nation have worked to aid in the development of infill by accelerating processing and acquisition, providing subsidies or low cost financing, and undergoing legal reform (Center for Urban Policy Research, 2006; PolcyLink, 2002). Other development tools have included density bonuses, reduced parking requirements, the creation of mixed use zoning, allowing transfer of development rights, and constructing design standards that reflect the neighborhood context to minimize NIMBY sentiments (Center for Urban Policy Research, 2006; Bragado, 1995). Beyond the local level, over 20 states have promoted Smart Growth or infill-oriented policies like the Priority Funding Area's (PFAs) in Maryland. Federal programs such as the Partnership for Sustainable Communities combines the Environmental Protection Agency (EPA), Housing and Urban Development (HUD), and the Department of Transportation (DOT) to promote "livability principles," most of which consist of Smart Growth principles and specifically include the redevelopment of underutilized sites (EPA, 2009).

U.S. Development Trends

Demographics and Household Preferences

Increased attention on infill development in recent years has revolved around the notion that U.S. demographic trends will fuel the demand for more in-town living and urbanized lifestyles in the upcoming decades. Myers and Pitkin (2009) suggest the aging of the Baby Boomer generation and the revival of large-scale immigration are two major population groups that will shape housing demand and markets. Baby Boomers and their children are currently estimated at 77 million and 78 million respectively, representing the two largest generations in U.S. history (Volk & Zimmerman, 2011). Both retiring Baby Boomers and their children (the Echo Boomers) will sway demand towards "relative(ly) small-lot, high density housing types that characterize infill development" (Wegmann & Nemirow, 2011). This is attributed to the decline in married-couple households as Echo Boomers in their 20s and 30s delay family formation. Demographers project that 75%-85% of households formed through 2025 will be without children (Dunhan-Jones & Williamson, 2011). As of June 2011, 63% of current American

households consist of just 1-2 people (Volk & Zimmerman, 2011). In addition, an increasing immigrant population, which was estimated at 40 million in 2010, will contribute to increasing urbanization as foreign born residents have a tendency to live closer together in central city and inner suburban clusters (McIlwain, 2010).

Coinciding with demographics, preferences towards smaller, more compact, and urban housing have followed suit (Filsram, 2010). This is particularly evident in the emerging downtown trends across the U.S. in which local governments are working to make downtowns more attractive and livable to capture the economic benefits of such preferences (Kemp, 2011). Leinberger (2008) believes "the most compelling evidence is the price premium people are willing to pay to live in a walkable urban place." Furthermore, Volk and Zimmerman (2011) suggest that the Millenial generation will be the first "post-racial generation" in which the vibrancy of racial, ethnic and religiously diverse neighborhoods is desired and appreciated.

However, not all demographic groups hold these housing preferences. Consumer preference surveys consistently find the majority of respondents desire "single-family homes located in low-density, suburban neighborhoods over compact, neo-traditional, and other alternative neighborhood types" (Wegmann & Nemirow, 2011). According to Lewis and Baldassare (2010), public opinion in support of compact development is significant across many socio-demographic groups yet those with children and politically conservative groups do not favor compact development. In addition, Koppen (2009) found that approximately 80% of Baby Boomers want to stay in their current homes and age in place.

Densification Trends

The way in which density and spatial patterns play out is often a factor of socioeconomic histories and cultural differences among and within U.S. cities. Cities typically in the Northeast, that developed before the advent of the automobile have urban cores with higher population densities and smaller developed areas per capita (McDonald, Forman, & Kareiva, 2010). From 1990 to 2000, McDonald et al. (2010) found that these cities got less dense as proportions of the population moved out to the suburbs. In contrast, newer southern cities often lack a dense urban core. McDonald et al. (2010) determined that despite vast population growth these cities did "not appear to be getting markedly denser" from 1990-2000. Lastly they found that western cities, which historically did not have dense urban cores, were growing quickly from 1990-2000 and became denser largely because of a strong "conservation culture" as well as "reform-minded zoning correlates."

The 2010 Census shows that the shift of population continued to move south and west from 2000 to 2010. Growth remained concentrated in low and medium density counties with only 12.7% of population growth over the decade occurring in high-density areas (Joint Center for Housing, 2011). However, leading into the 2008 recession, residential development in central cities and core suburbs as a share of regional construction has been greater than previous decades. The EPA (2010) determined that from 2000 to 2008, 26 cities doubled or tripled their share of their regions' residential building permits with 2006 being the highest annual share from 1990-2008. Cities such as Los Angeles, Denver, Dallas, Portland, Seattle, Sacramento, San Francisco, Miami, and New York City have had substantial increases of infill development as a percentage of regional construction. For example, in the early 1990's New

York City issued 15% of the residential building permits in the region whereas from 2002-2008 it averaged 48%.

This move towards densification and development in the urban core was not consistent across the country however. Other cities such as Atlanta, Philadelphia, Boston, Washington DC, and Minneapolis experienced substantial increases in their share of their regions' residential construction, however this remained below a fifth of the regional building permits. A large selection of cities had minimal change or even a decreased share of construction within the central city including places such as San Jose, San Diego, Salt Lake City, Providence, Buffalo, Pittsburgh, and Cleveland. While census data from 2008 suggests infill development overall is becoming more mainstream, the authors conclude that these residential construction trends are "not yet reshaping the face of urban America as a whole" (EPA, 2010). Center city development has increased their development share two or three times since the early 1990's, but in most regions it still accounts for less than 50% of all new residential construction (EPA, 2010).

The Great Recession

The onset of the Great Recession has generated an economic environment that has greatly affected housing markets, residential development, and the prevailing trends. In comparison to prior recessions, the effects of this recession are increasingly drastic due to "simultaneous shocks in the stock market, the housing market, and the labor market" (Hurd & Rohwedder, 2010). For numerous reasons beyond the scope of this study, the recession has resulted in a severe tightening of lending, ruined the credit standing of many households, greatly reduced household wealth and exasperated the foreclosures throughout the nation causing record housing vacancy. Hurd and Rohweder (2010) indicate that by April 2010, approximately 40% of households had experienced financial distress either by unemployment, negative home equity, overdue mortgage payments, and foreclosure. In addition, younger and lower income households continue to be more severely impacted.

Construction

Residential construction has dramatically declined across the country from the peak of the recession and continued to be severely depressed into 2011. Due to widespread vacancy and persistent unemployment, the inventory of new housing for sale has fallen to a 40-year low at 183,000 units (Joint Center for Housing Studies, 2010). 2010 was the third consecutive year that total housing starts were well below 1 million, differing from past recessions in which the construction rates rebounded quickly as annual starts reached below 1 million. In HUD's most recent U.S. Housing Market Conditions report (2012), housing production continued to show a "fragile recovery" through the end of 2011. The report indicates that the number of national housing starts rose in single family and multi-family construction but the number of housing completions declined in both sectors. Construction was up 7% from the 3rd quarter for new housing units, while building completion was down 7% from the 3rd quarter. Overall, the construction outlook remains bleak, as a large portion of transactions are distressed sales and foreclosure auctions which will continue to stagnate home prices and keep homeowners in positions of negative equity.

Housing Markets

The recession has drastically altered the nature of the American housing market as well. A significant outcome of the recession is the accelerated differentiation between rental markets and housing markets. Before the recession, the rental market began to pick up as the number of rental households has been growing since 2004. The Housing Vacancy Survey estimates that from 2004-2010, the number of renters increased by 3.9 million (Joint Center for Housing Studies, 2011). The effects of the recession however have quickened the transitioning of the rental market. This is evidenced by the beginnings of a recovery of the rental market as the housing market continues to flounder. In all metropolitan markets besides Las Vegas, Fort Myers, and Tucson, rental rates and rental property values have begun to rise and rental vacancy rates have fallen (Joint Center for Housing Studies, 2011). This is largely in part due to a large number of households transitioning from homeownership to renting as homeownership becomes less attainable.

In comparison, homebuyer demand has not improved as large shares of homeowners are underwater with their mortgages, credit is not easy to obtain, foreclosures have not yet stabilized, and home prices in some areas continue to decline (Joint Center for Housing Studies, 2011). The impacts of the housing crisis, however, have not been uniform across the country. Arizona, Nevada, Florida, and California have been particularly hard hit; home values have declined over 50% in some metro areas throughout these states (Katz, 2011). By the end of 2010, homeownership rates fell below 66%, down from the peak at 69% in the middle of the decade (Katz, 2011). It is predicted that the decline of homeownership will continue as household growth has slowed and many would-be homebuyers lack economic confidence to invest in a home. Furthermore, internal migration has drastically slowed, as millions of Americans are unable to sell their home or uncertain about job prospects elsewhere (Medina & Tavernise, 2011). The 2010 Census revealed that domestic migration has fallen substantially from the start of the recession, dropping to the lowest level since the Census began tracking migration in the 1940's (Medina & Tavernise, 2011).

The effects of the recession on housing markets are most severe in low-income, minority communities particularly African Americans and Latinos. The Joint Center for Housing Studies (2011) indicates the median value of homes owned by minorities declined 20% in comparison to 13% for Caucasians through the recession. Furthermore, the median mortgage debt among minorities who owned homes was 13.5% higher than whites while their median home equity was 26.8% lower. As overall homeownership rates decline, the disparity will grow disproportionately as large numbers of African Americans and Latinos were victims of predatory lending practices in addition to experiencing lower income levels and higher unemployment than Caucasians (McIlwain, 2010).

A changing paradigm?

Many academics point to the foreclosure and economic crisis as helping to accelerate a fundamental transition of the housing market to more compact, smaller lot, higher density development (Duhnam-Jones & Williamson, 2011; Leinberger, 2008; Kemp, 2011; Volk & Zimmerman, 2011). Duhnam-Jones and Williamson (2011) state, "the housing market has been undergoing a painful, but positive, correction back to historically and environmentally more sustainable conditions." This "correction" also refers to drop in housing values, which has

allowed housing prices to be more on par with incomes. The transition has also included a decline in the median square footage of new single-family houses from 2,277 Sq. Ft. in 2007 to 2,169 Sq. Ft. in 2010 (U.S. Census Bureau, 2010). First time homebuyers have shown a preference towards smaller, lower maintenance homes, which emphasize fundamentals such as quality neighborhoods and strong schools rather than luxury features (Filsram, 2010). Some predict that overall declines in incomes for 25-34 year olds in the past decade- 3% for women and 12% for men- will lead to more modest lifestyles in the coming decade with less money spent on housing (U.S. Census Bureau, 2010). Furthermore, credit constrained households are limited in their ability to take advantage of the decline in home prices of larger homes (Hur, 2012) Other factors include a greater awareness and concern of energy efficiency and a growing small-house design movement. Surveys indicate that 50% of homebuyers desire green homes (McIlwain, 2010) and new conceptual models for home design such as the "Home for the New Economy" illustrate the desire for compact and energy efficient housing (Builder Magazine, 2010).

In addition, recent literature suggests that there may be a shift in how Americans view homeownership, no longer seeing the purchase of a house as a stable investment for accumulating wealth (Fisher & Gervais, 2011). According to McIlwain (2010), the Millenial generation has first hand experience in the potential consequences of owning a home in a down market and the effects on household finances and professional mobility. Due to the housing crisis, millions of foreclosures and high numbers of people stuck in underwater mortgages have lost confidence in the stability of homeownership. As the economy recovers slowly, many predict that the multi-family market will be very strong, as most new households will be renting far longer than previous generations. This is due to constrained credit flows, flat or declining incomes, and large debts from extended schooling (McIlwain, 2010). Fisher and Gervais (2011) point to higher earnings risk and increasing earnings uncertainty among 24-35 year olds as contributing to the declining home ownership rate and slowing the transition to homeownership. Some academics believe that homeownership in America will settle in the low 60% range, far below its peak of 69% in 2005 (Katz, 2010). As for low-income and minority groups, programs which encourage homeownership as forced savings and wealth building have been in question in recent years, as these groups have experienced the highest rates of default and foreclosures. Rohe and Watson (2007) argue that homeownership is riskier for low-income households because of their inability to withstand income or budget shocks, the unawareness or inability to refinance, and the failure of low-income households to qualify for mortgage interest tax deductions- a major economic benefit of homeownership.

Despite some evidence of changing homeownership and household preferences, others believe that the recession has only resulted in temporary changes in behavior and has not produced a fundamental shift in the ideal of homeownership and American lifestyles. Rybczinski (2011) points out that past recessions have not had long lasting effects and that it would be unusual if the demand for smaller homes remains strong as "choosing where one lives has never been a strictly economic proposition." According to the Fannie Mae National Housing Survey in 2011, householders under 35 years old continue to remain optimistic about homeownership and 62% believed that owning a home was a safe investment (Joint Center for Housing Studies, 2011). In March 2011, the Pew Research Center found that 37% of U.S. adults still strongly agree, "buying a home is the best long-term investment a person can make" and

even more adults slightly agreed (Bracha & Jamison, 2011). Even after one of the worst housing crises in U.S. history, it seems that attitudes continue to go beyond financial rationales and reflect a persistent underlying belief in homeownership. In addition, Rybczinski (2011) negates the significance of the decline in square footage of new homes, arguing that current homebuyers are first-timers who can only afford modest homes that qualify for an FHA mortgage. He argues larger homes are not being built at the current time since move-up homebuyers cannot sell their existing homes in today's housing market. Therefore, the move toward smaller homes is only a function of who is buying a home, not a fundamental shift in consumer preference.

There is also no agreement across the literature that consumer preference towards urban and denser living has dramatically changed in recent years. Rybczinski (2011) points to the plethora of empty condominiums in urban centers as evidence that development was an outcome of the housing bubble, rather than a significant change in consumer preferences. As discussed earlier, strong preferences for single family traditional living still exists by major socio-economic groups. If the majority of Baby Boomers stay in their homes to age in place as 80% say they desire to (Koppen, 2009), the number of seniors living in suburban areas will grow dramatically over the next two decades (Joint Center for Housing Studies, 2011). In addition, due to the erosion of retirement savings and home equity from the Great Recession, it is believed that more Baby Boomers are expected to work well past typical retirement age, which may keep them tied to their houses. Lastly, building in densely urban areas continues to present obstacles as discussed previously such as environmental, legal, and zoning challenges. Jurisdictions across the country must undergo a radical shift in order to allow urban living to become affordable and ease the development process (McIlwain, 2010) in many locales.

III. Data and Research Methodology

The following section describes the data sources used for analysis, the process of converting data from 2000 census tracts to the equivalent 2010 census tracts, as well as the general research methodology.

Data Sources

The three sources used for analysis included the 2000 Census, the 2005-2009 American Communities Survey (ACS), and the 2010 Census. All three sources are publically available from the United States Census Bureau, the leading data source for demographics and economic data within the United States. The data from the decennial Census is collected in April of each year and the ACS data is collected on a monthly basis. The American Communities Survey will serve as mid-2007, since it is the rolling average from 2005-2009. In this sense, the time period through which the data covers is from 2000 to mid-2007 and then from mid-2007 until early 2010, when the Census data was released. The mid-2007 time point represents the onset of the Great Recession while the 2010 time point represents the end of the Great Recession. Four variables were obtained from each data source at the census tract level including population, housing units, occupied units, and vacant units.

In order to compare data overtime from 2000 to mid-2007 to 2010, it was necessary to convert the data from the 2000 tract boundaries to the equivalent value in 2010 tract boundaries. The 2000 Census and the 2005-2009 ACS both use 2000 census tract boundaries

while the 2010 Census uses 2010 tract boundaries. In transition from the 2000 to 2010 census tracts, many changes were made, making it inaccurate to directly compare the two datasets. These changes include consolidation of two tracts, splits in tracts, or many-to-many changes. In order to account for this change, all 2000 Census data and ACS data was downloaded and directly brought into the Longitudinal Tract Data Base developed by researchers John Logan from Brown University, Zengwan Xu from University of Wisconsin and Brian Stults from Florida State University (Brown University, 2010). This system uses a crosswalk file in Microsoft Access that is programmed to turn each 2000 tract boundary into its equivalent 2010 boundary based on the type of change that occurred. The four variables were directly imported into the crosswalk file and were then reprogrammed to generate an equivalent dataset within 2010 tracts, ultimately allowing for direct comparability between the three datasets. It is important to note that some error may exist with the tract changes, due to complicated multi- tract changes that cannot be accommodated by the formula. This may lead to a few tracts in each city not having data, however it is not significant.

Research Methodology

Twelve cities were analyzed with the intent of obtaining a comprehensive view of decentralization or centralization trends across the U.S. The process for city selection was based on the EPA Study " Residential Construction trends in America's Metropolitan Regions" released in 2010. The EPA classifies densification trends in MSA's leading up to 2008 using three categories: "Substantial increase and a significant share of regional construction," "Substantial increase, but less than a fifth of regional permits," and "Minimal change or a decreased share." Seven cities were chosen from the classification "Substantial increase and a significant share of regional construction" including Denver, Dallas, NYC, Los Angeles, Miami, Sacramento and Seattle. Five cities were selected from the category "Substantial increase, but less than a fifth of regional permits" including Birmingham, Philadelphia, Kansas City (MO), San Francisco, and Baltimore.

In order to consider variation in housing market changes during the housing crisis, cities with larger and smaller housing price changes were selected. For each city, the percent change in Housing Price Index (HPI) from the 2nd quarter of 2007 to the 1st quarter of 2010 was calculated based on the Federal Housing Finance Agency's Housing Price Index (HPI). In each of the building permit change categories, the three cities with the highest and lowest percent change were selected for further analysis. The "Minimal change or a decreased share" category was not included, because these cities did not show increased centralization leading up to the recession. In the category "Substantial increase, but less than a fifth of regional permits," Washington D.C. was omitted due to variation in how the MSA is categorized. In the category "Substantial increase and a significant share of regional construction," New York City is a likely outlier due to its geographic proximity to other large MSA's. Therefore, Seattle was added to the analysis, with the 4th smallest percent change in HPI. Table 1 indicates the HPI results for the selected cities:

Year	Qt.	Dallas	Denver	LA	Miami	NYC	Sacramento	Seattle	Birmingham	Philadelphia	Minneapolis	Kansas City	Baltimore
2007	2	165.0	199.3	331.8	342.1	271.7	263.0	262.6	175.8	219.4	230.1	179.5	253.7
2007	3	163.7	196.2	325.7	336.7	268.9	250.7	263.8	174.8	218.8	225.1	178.3	251.5
2007	4	165.3	197.6	315.4	331.0	268.7	241.7	264.3	176.4	219.2	224.9	178.6	251.5
2008	1	167.0	198.4	298.5	316.3	268.1	230.7	263.1	179.1	220.2	225.2	178.6	249.5
2008	2	166.7	197.3	276.2	293.8	261.9	212.4	257.9	177.4	217.1	217.3	177.0	243.6
2008	3	166.1	193.6	257.8	259.5	254.1	198.5	250.3	175.3	213.2	209.8	173.4	235.6
2008	4	167.4	194.8	249.1	241.0	252.0	193.2	246.1	177.6	213.2	209.2	173.4	233.5
2009	1	170.0	199.0	246.8	234.9	252.4	195.2	243.5	180.4	214.4	212.5	176.5	232.5
2009	2	168.4	196.5	237.6	223.1	246.9	187.7	232.8	177.6	211.2	205.8	174.5	224.4
2009	3	165.8	192.5	234.2	209.1	240.1	180.4	224.7	173.1	207.1	196.3	171.1	219.9
2009	4	166.2	193.1	237.3	210.5	238.8	178.4	222.4	172.2	206.3	194.6	170.3	216.2
2010	1	166.0	192.0	236.0	205.8	237.3	176.0	218.7	169.5	205.4	191.3	168.5	214.9
% Change		**0.65**	**-3.64**	**-28.88**	**-39.84**	**-12.66**	**-33.07**	**-16.72**	**-3.56**	**-6.41**	**-16.87**	**-6.13**	**-15.29**

Table 1: Housing Price Index from Q2 2007 to Q1 2010

For each of the twelve cities, census tracts were defined into five intrametropolitan spatial areas. The first geographic area is the place boundary of the city, defined by the 2010 Census. The place boundary can be found in blue on all maps. Following this boundary, a buffer line was created at 1, 3 and 10 miles, indicated in black on all maps. The outer most zone is the region between the 10 - mile boundary line and the MSA boundary line as defined by the Census. The MSA boundary is in red on all city maps. The core is defined as census tracts within the place, place – 1 mile, and 1 – 3 mile boundaries. The non-core is defined as the 3 – 10 mile boundary and the 10 mile – MSA boundary.

Four variables; population, housing units, vacant units, and occupied units were obtained at the census tract level and aggregated into spatial zones depending on the location of the tract centroid. For each spatial zone, the net changes in population, housing units, vacant units, and occupied units were calculated as well as the percent changes for each variable. From 2000 to 2007 and 2007 to 2010, percent change results were annualized in order to compare results from both time periods.

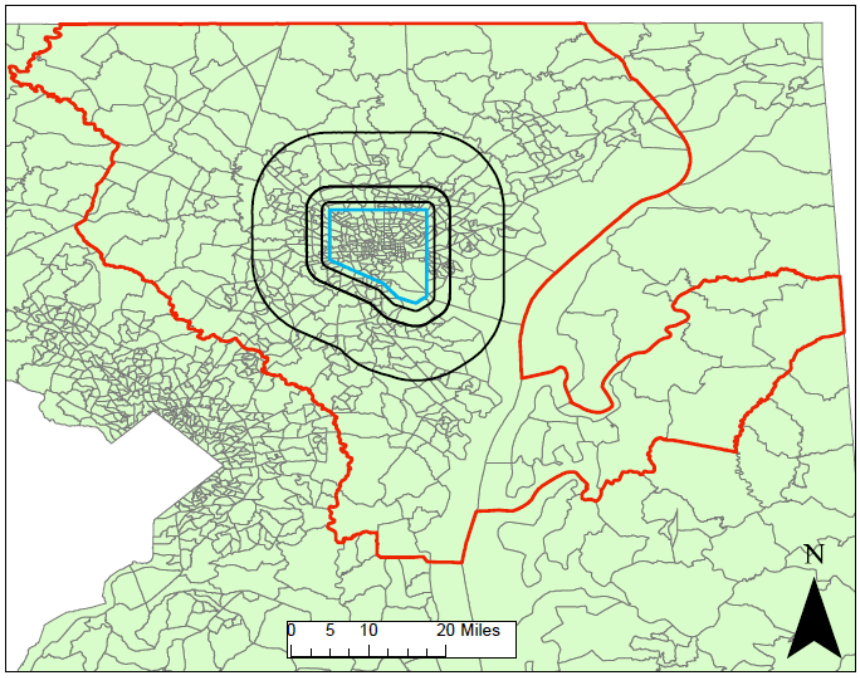
To measure whether decentralization or centralization occurred for the time periods of interest, two measures were used. The first measure subtracts the percent change of the core from the percent change of the non-core. This measures whether a larger percent of population, housing, vacant, or occupied units moved towards the core or the non-core in the time period of interest. If the measure is positive, it indicates that the core area grew slower or declined faster than the non-core area during the time period. If the measure is negative, it indicates the core area grew faster or declined more slowly than the non-core area. The second measure calculates the share of each variable that is located within the core areas and compares that in 2000, 2007, and 2010. This measures if the core's share of the MSA-wide variable increased or decreased.

IV. Results and Discussion

The following section will discuss the results for each city individually. To compare the twelve cities, the two centralization indicators will be analyzed across the cities.

Baltimore, Maryland

Map 1 shows the spatial zones of analysis for the Baltimore MSA:



Map 1: Baltimore, MD

Table 2 shows the annualized percent change for each variable within the MSA:

2000-2007	Population	Housing Units	Vacant Units	Occupied Units
PLACE	-.26%	-.28%	4.24%	-1.16%
PLACE - 1 MILE	-.03%	-.10%	1.68%	-.18%
1 - 3 MILE	.23%	.12%	2.57%	-.01%
3 - 10 MILE	.90%	1.08%	4.21%	.93%
10 MILE - MSA	1.31%	1.70%	6.06%	1.48%
Totals	2.14%	2.51%	18.75%	1.06%

2007-2010	Population	Housing Units	Vacant Units	Occupied Units
PLACE	-.42%	.10%	-2.73%	.71%
PLACE - 1 MILE	.22%	.20%	4.64%	-.06%
1 - 3 MILE	.51%	.59%	1.83%	.52%
3 - 10 MILE	-.52%	-.57%	-.86%	-.56%
10 MILE - MSA	.34%	.39%	.49%	.38%
Totals	0.00%	.01%	3.37%	.99%

Table 2: Annualized Percent Change in all Variables from 2000-2007 & 2007-2010

Population

From 2000 to 2007, the non-core areas within the Baltimore MSA experienced positive population growth as well as the 1 – 3 mile area. The place and place – 1 mile areas experienced negative population change at -.26% and -0.03% respectively. As Figure 1 shows, the 10 mile – MSA boundary was the fastest growing area for population at 1.31% per year. During the recession, both non-core zones as well as the place boundary experienced a slowing of population growth. While the place – 1 mile and 1 – 3 mile boundary accelerated in population growth from 2007 to 2010, these rates remained below 0.5%.

Figure 1: Annualized Percent Change in Population

Housing Units

The Baltimore MSA experienced a decline in housing units both in the place and place -1 mile boundaries from 2000 to 2007 at an annual rate of -0.28% and -0.1% respectively. The non-core areas were growing faster than the core-areas with the 10 mile -MSA zone experiencing the fastest rate at 1.7%. During the recession however, both of these trends reversed. The core areas, which previously were negative, began to show positive growth in housing units and the 1 – 3 mile zone accelerated in growth. Conversely, all non-core areas slowed during the recession. This was most significant for the 3 – 10 mile boundary which went from an annual growth rate of 1.08% to an annual rate of -0.57% per year from 2007 to 2010.

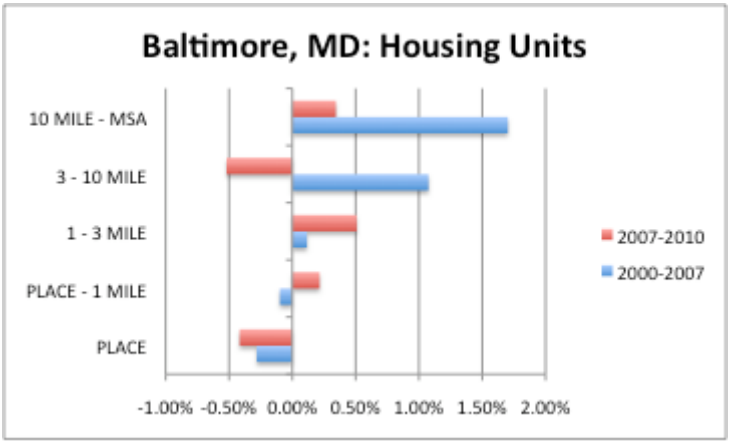


Figure 2: Annualized Percent Change in Housing Units

Vacant Units

From 2000 to 2007, the percent change in vacant units for every spatial zone was increasing

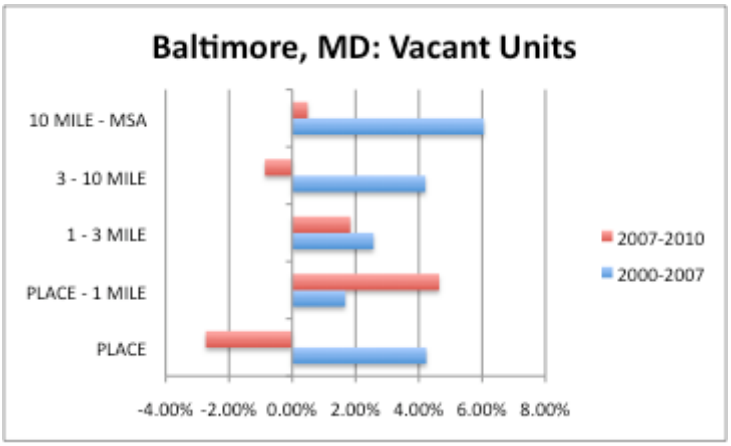


Figure 3: Annualized Percent Change in Vacant Units

throughout the Baltimore MSA. Vacancy was increasing fastest in the 10 mile - MSA zone at an annual rate of 6.06%, followed by the place zone and the 3 – 10 mile boundary at 4.24% and 4.21% respectively. From 2007 to 2010, it is these three zones that had the most drastic changes. The 10 mile – MSA zone saw a dramatic slow down in vacancy going to a 0.49% annual rate while the 3 – 10 mile zone began to decline at -0.86% per year. Vacancy growth rates for the place boundary saw the strongest trend reversal, going from a 4.24% annual rate from 2000 to 2007 to a declining rate of -.2.7% per year from 2007 to 2010. While vacancy was growing at a slower rate for the place – 1 mile are from 2000 to 2007, this zone increased its rate of vacant units quite dramatically during the recession from 1.64% to 4.64%.

Occupied Units

From 2000 to 2007, the non-core areas showed positive growth in occupied units while all core areas showed a declining rate of occupied units. The place zone was losing occupied units the fastest at -1.16% annually. During the recession, the non-core areas drastically slowed in the growth of occupied units or as in the case of the 3 – 10 mile, began to have a negative rate of growth. Conversely, the core areas accelerated in the growth of occupied units, or at least slowed the rate of decline. This was most dramatic for the place boundary which went from a -1.16% annual rate to a rate of 0.71% per year.

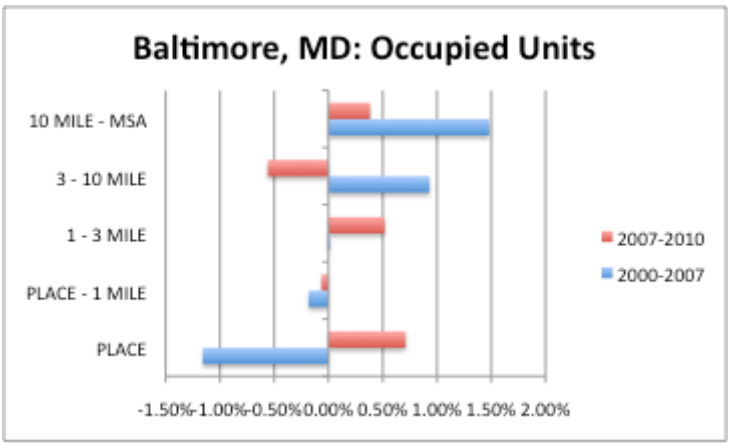


Figure 4: Annualized Percent Change in Occupied Units

Centralization Indicators

Table 3 shows the annualized percent change for each variable within the core and non-core variables and the results of indicator 1:

Population	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	-8,439	-0.82	-0.12%	116,993	4.58	0.64%	0.76%
2007-2010	-7,662	-0.75	-0.25%	40,499	1.52	0.50%	0.75%

Housing Units	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	-5,501	-1.20	-0.17%	55,961	5.34	0.75%	0.92%
2007-2010	7,020	0.69	0.23%	28,243	2.56	0.85%	0.62%

Vacant Units	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	15,476	31.31	3.97%	26,152	35.35	4.42%	0.45%
2007-2010	-8,195	-12.63	-4.40%	-6,641	-6.63	-2.26%	2.14%

Occupied Units	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	-20,977	-5.12	-0.75%	29,809	3.06	0.43%	1.18%
2007-2010	15,215	3.91	1.29%	34,885	3.48	1.15%	-0.14%

Table 3: Annualized Percent Change of the Non-Core less the Core

The first measure of centralization, as seen in Table 3, suggests that the population of the non-core grew faster than the core area. This difference remained constant during the recession. While housing units continued to grow faster in the non-core area, this rate declined during the recession. This is largely because housing unit growth in the core area became positive during the recession when it had previously been negative. For the vacant unit indicator, the non-core area was growing faster than the core area in vacant units from 2000 to 2007. During the recession, both the core and the non-core saw declining rates of vacant units, but the core was declining faster than the non-core so the indicator remained positive. Lastly, from 2000 to 2007, the growth of occupied units decentralized as the core area grew and the non-core area declined. While both the non-core and core area saw accelerated occupied

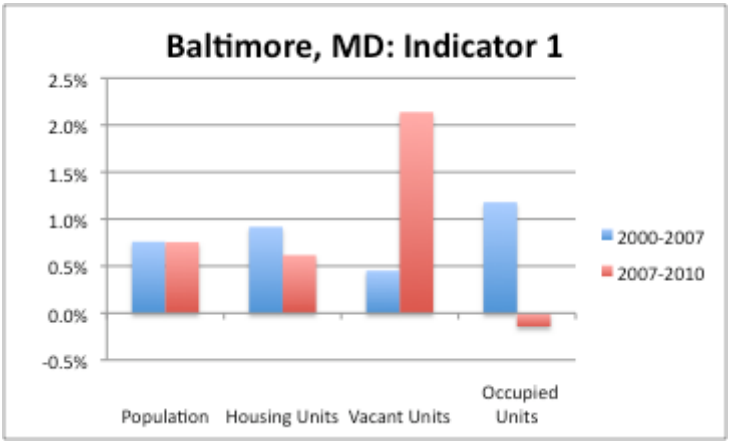


Figure 5: Annualized Percent Change of the Non-Core less the Core

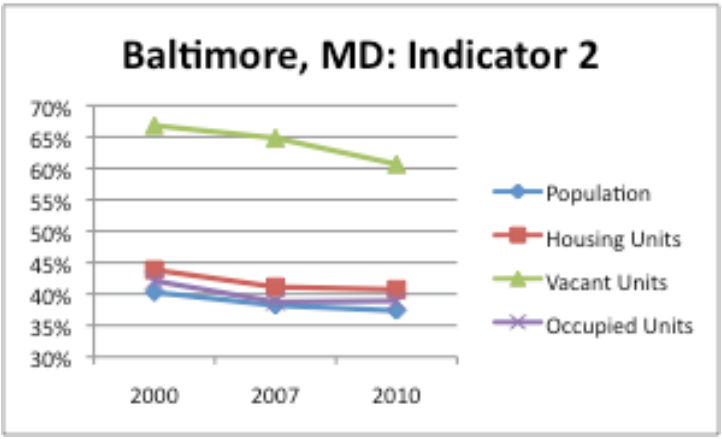


Figure 6: Core's Share of all Variables from 2000-2010

unit changes during the recession, the core area grew at a slightly faster rate and therefore centralization of occupied units began to occur. See Figure 5.

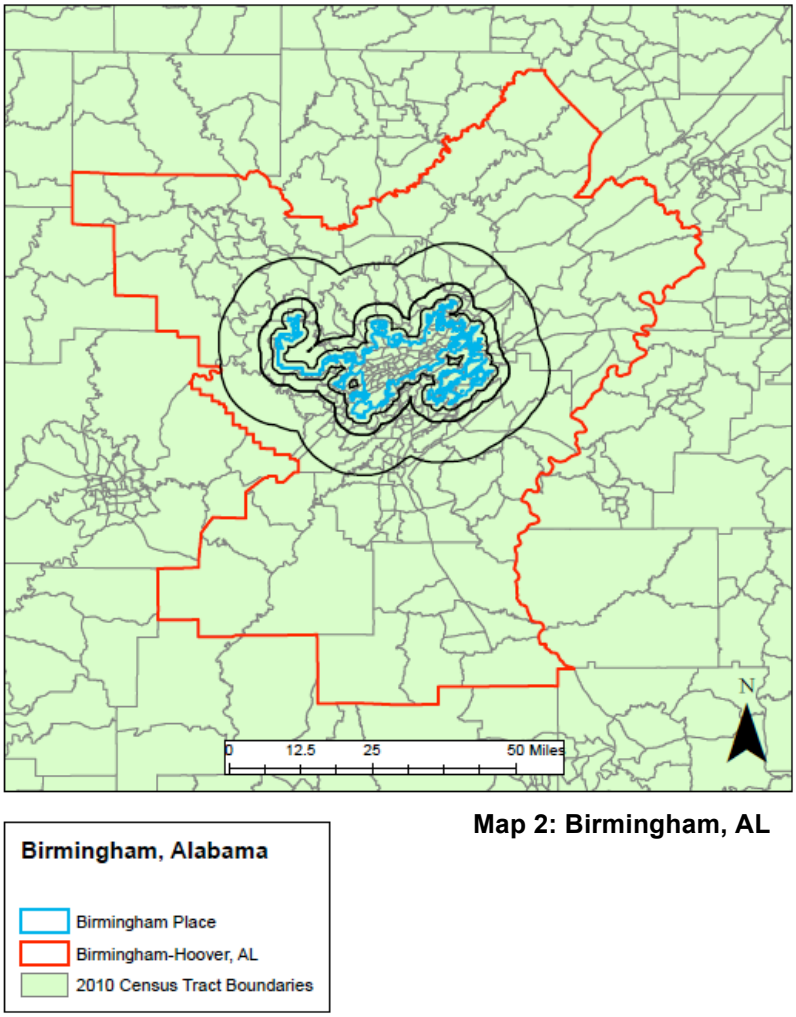
The second measure of centralization, as shown in Figure 6, indicates the core's share of total population declined during both periods from 40.27% to 37.34%. Similarly, housing units within the core dropped from 43.83% in 2000 to 40.71% in 2010. The core's share of occupied units grew slightly during the recession from 38.75% to 38.91%. Most significantly, the core's share of vacant units declined in both time periods, from 66.82% in 2000, to 64.82% in 2007, and then 60.66% in 2010.

Summary

During the recession, the MSA's population growth, housing unit growth, and vacant unit growth slowed considerably compared to rates experienced in the previous time period. Occupied unit growth only saw minor slowing from 2007 to 2010. Decentralization continued during the recession but the rate slowed for population, housing units, and vacant units, while the growth of occupied units began to centralize. Of particular strength was the fast rate of decline for vacant units in the core area during the recession. Overall, it seems that while decentralization slowed, the non-core areas continued to experience more of the growth as well as a slight increase in the share of housing units, population, and occupied units.

Birmingham, AL

Map 2 shows the spatial zones of analysis for the Birmingham MSA:



Map 2: Birmingham, AL

Table 4 shows the annualized percent change in each variable for the 5 spatial zones within the Birmingham, MSA:

2000-2007	Population	Housing Units	Vacant Units	Occupied Units
PLACE	-0.89%	0.64%	7.01%	-0.43%
PLACE - 1 MILE	0.48%	1.09%	7.05%	0.53%
1 - 3 MILE	0.66%	1.49%	8.37%	0.92%
3 - 10 MILE	-1.69%	-1.99%	-5.71%	1.52%
10 MILE - MSA	1.48%	1.30%	0.58%	-9.34%
Totals	0.03%	2.53%	17.3%	-6.8%
2007-2010	**Population**	**Housing Units**	**Vacant Units**	**Occupied Units**
PLACE	-1.08%	-1.22%	-1.46%	-1.16%
PLACE - 1 MILE	0.25%	0.20%	0.63%	0.15%
1 - 3 MILE	0.49%	-0.02%	-2.49%	0.27%
3 - 10 MILE	2.55%	2.70%	5.41%	2.50%
10 MILE - MSA	0.67%	0.80%	-0.26%	-10.08%
Totals	2.88%	2.45%	1.84%	-8.35%

Table 4: Annualized Percent Change in all Variables from 2000-2007 & 2007-2010

Population

Both the core and non-core areas experienced mixed results in population growth and decline for the 2000 to 2007 period. The 10 mile - MSA boundary was growing the fastest at 1.48%, however the non-core area did not grow as a whole because this rate was countered by the 3- 10 mile zone which was declining at -1.69% per year. For all spatial zones within the core, population growth slowed or continued to decline through the recession. The place zone was the only area to lose population, which accelerated from -0.89% to -1.08% from 2007-2010. The 10 mile- MSA zone slowed from a 1.48% annual rate to a 0.67% annual rate, but the non-core saw rapid expansion of the 3- 10 mile zone from a loss of -1.69% annually to 2.55% annual population growth through the recession.

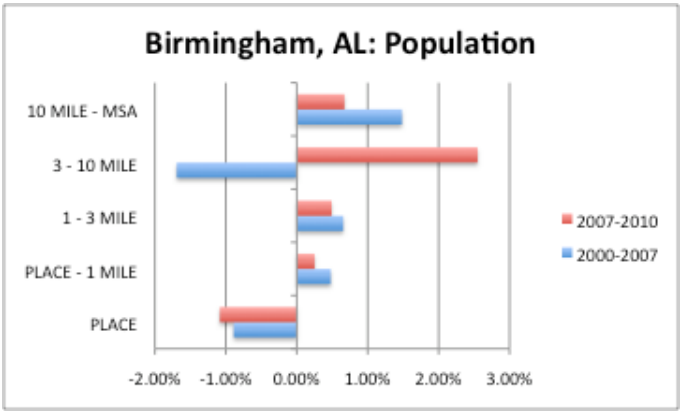


Figure 6: Annualized Percent Change in Population

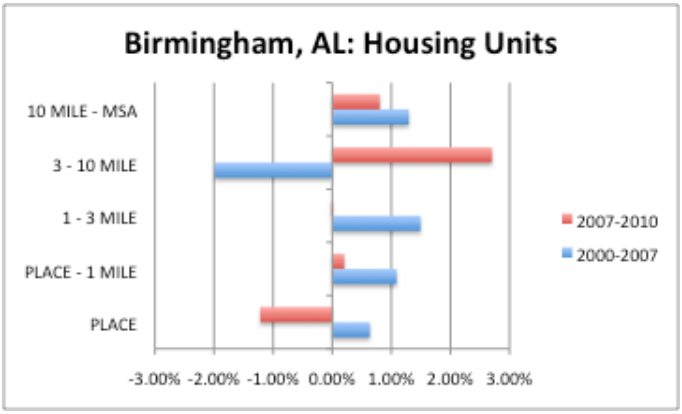


Figure 5: Annualized Percent Change in Housing Units

Housing Units

Birmingham's core added units in all zones from 2000 to 2007 as seen in Figure 8. During the recession, this trend essentially reversed. Most dramatically, the place area went from an annual growth rate of 0.64% to an annual decline of -1.22%. The 1 – 3 mile zone was growing the fastest of any area from 2000 to 2007 with a 1.49% increase in housing units annually, but this trend declined to a loss of -0.02% in the latter time period. Following population trends, the 3 – 10 mile zone was losing housing units at a -2% annual rate from 2000 to 2007 but dramatically reversed to 2.7% annually, the greatest growth rate of any time period or zone. The 10 mile - MSA area continued to add units in both periods, but slowed its pace during the recession from 1.3% to 0.8%.

Vacant Units

From 2000 to 2007, all zones within the core saw vast increases in vacant units at 7.01%, 7.05%, and 8.37% annually for the place, place – 1 mile, and 1 – 3 mile areas respectively. During the recession, this dramatically declined with both the place area and the 1 – 3 mile boundary experiencing declining rates of -1.46% and -2.49% respectively. The 3 – 10 mile zone experienced the opposite trend, with an annual vacant unit decline of -5.71% from 2000 to 2007 which accelerated to an annual rate of 5.41% during the recession. The 10 mile - MSA zone saw very little change, although it did stop adding vacant units during 2007 to 2010 with a slight decline of -0.26%. This indicates that vacancy in the central core was largely stabilized during the recession while the boundary just outside the core saw acceleration in vacancy rates.

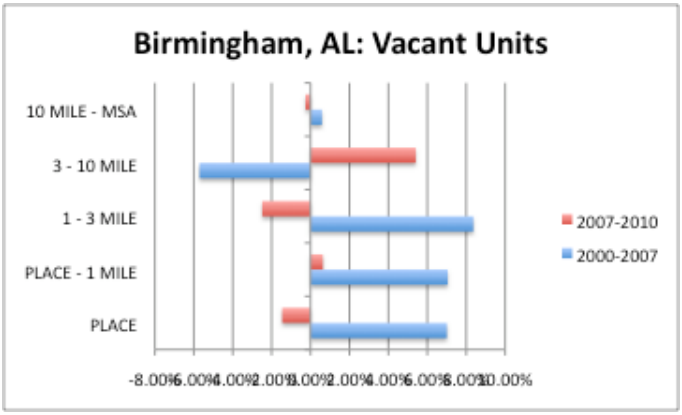


Figure 7: Annualized Percent Change in Vacant Units

Centralization Indicators

Table 5 shows the annualized percent change for each variable within the core and non-core variables and the results of indicator 1:

Population	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	-1,287	-0.23	-0.03%	2,499	0.24	0.03%	0.07%
2007-2010	-7,509	-1.34	-0.45%	46,263	4.34	1.43%	1.88%

Housing Unit	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	17,745	7.20	1.00%	16,183	3.51	0.49%	-0.50%
2007-2010	-8,064	-1.44	-0.48%	16,574	3.48	1.15%	1.63%

Vacant Unit	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	14,052	63.41	7.27%	15,584	35.37	4.42%	-2.85%
2007-2010	-2,748	-7.59	-2.60%	-2,290	-3.84	-1.30%	1.30%

Occupied Unit	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	3,692	1.65	0.23%	600	0.14	0.02%	-0.21%
2007-2010	-5,316	-2.33	-0.78%	18,864	4.52	1.48%	2.27%

Table 5: Annualized Percent Change of the Non-Core less the Core

The core and non-core were about equal in population change from 2000 to 2007 with very slight decentralization occurring. This changed quite significantly through the recession. Decentralization accelerated with the non-core area growing at 1.43% annually while the core area declined at -0.45% as seen in Figure 10. Housing unit growth began to centralize from 2000 to 2007, with the core area experiencing growth rates double the non-core area. This trend reversed during the recession and decentralization began to occur as the non-core's growth of housing units accelerated and the core declined in units. While the growth of vacant units occurred in both the non-core and core areas quite significantly, vacant unit growth centralized from 2000 to 2007 with the core area growing faster by 2.85%. This trend reversed during the recession with the core area declining

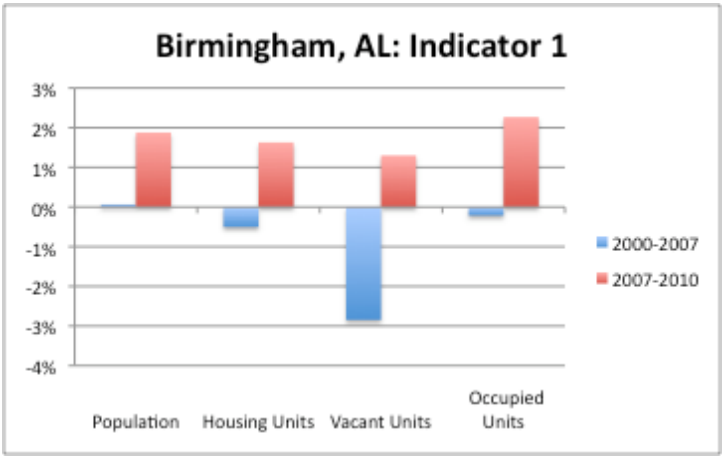


Figure 10: Annualized Percent Change of the Non-Core less the Core

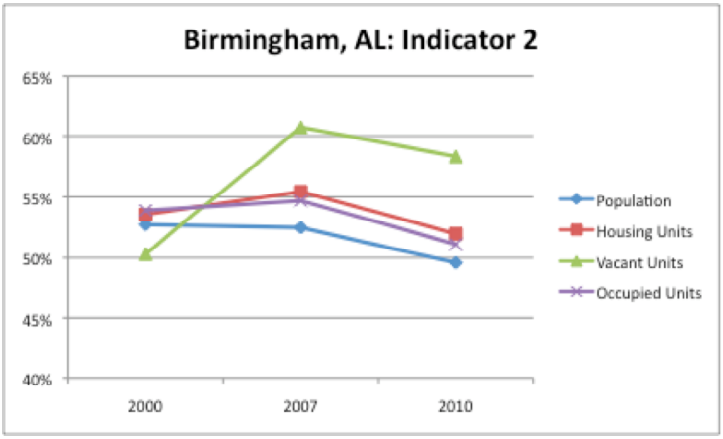


Figure 11: Core's Share of all Variables from 2000-2010

faster than the non-core area in vacant units. From 2000 to 2007, occupied units within the core area grew slightly faster than the non-core area. However, during the recession, this trend reversed and decentralization of occupied units occurred as the non-core area accelerated in speed and the core area began to decline in rate.

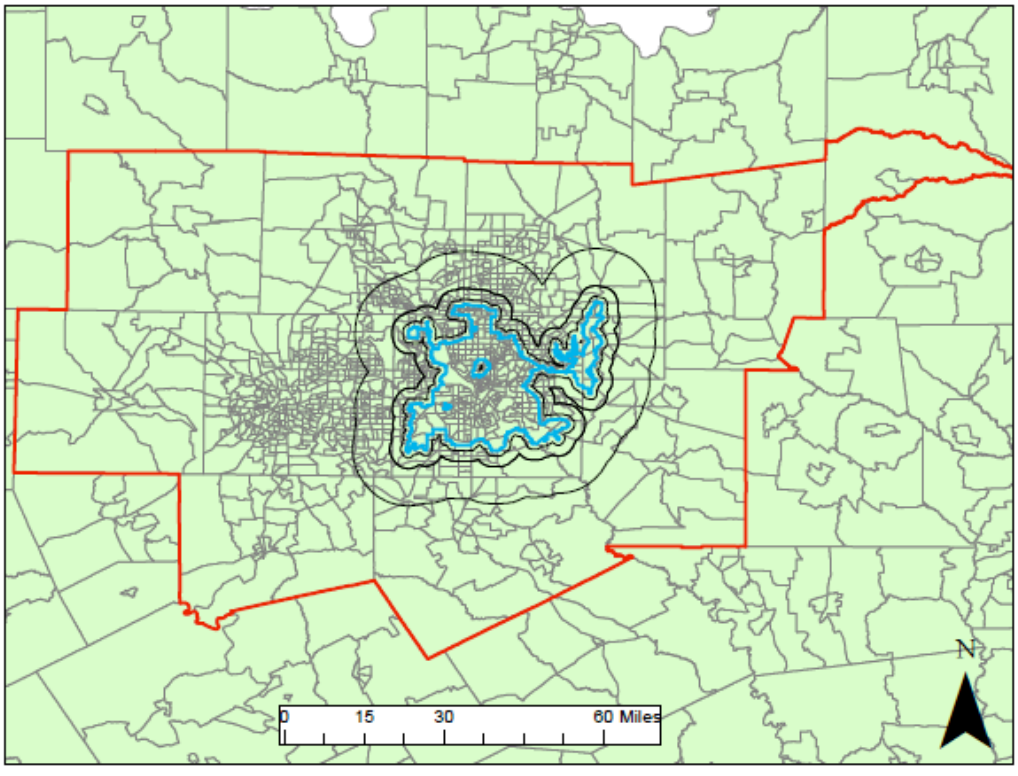
The second indicator, seen in Figure 11, shows that the core's share of housing units, vacant units, and occupied units increased from 2000 to 2007 but then declined from 2007 to 2010. The core's change in share of vacant units was most noticeable, which increased from 50.3% in 2000 to 60.72% in 2007 and then declined slightly to 58.35% in 2010. Population was the only variable to decline in share from 2000 to 2007, however it was very miniscule decline from 52.69% to 52.45%. This then dropped to 49.59% by 2010.

Summary

While housing units and population continued to grow during the recession, this was largely in the non-core areas. For population, housing units, and occupied units, decentralization accelerated in pace during the recession. The core area did experience a faster decline in vacant units within the core than the non-core. Prior to the recession, the core's share of population, housing units, and occupied units was increasing, but all these trends were reversed from 2007 to 2010. Overall, Birmingham experienced centralization towards the core from 2000 to 2007 and reversed this trend during the recession.

Dallas, TX

Map 3 shows the spatial zones of analysis for the Dallas, TX MSA:



Map 3: Dallas, TX

Table 6 shows the annualized percent change in each variable for the 5 spatial zones within the Dallas, TX MSA:

2000-2007	Population	Housing Units	Vacant Units	Occupied Units
PLACE	1.00%	1.52%	11.16%	0.58%
PLACE - 1 MILE	1.55%	1.32%	11.77%	0.72%
1 - 3 MILE	1.45%	1.42%	11.24%	0.80%
3 - 10 MILE	3.63%	3.18%	9.28%	2.77%
10 MILE - MSA	3.38%	1.20%	0.67%	20.66%
Totals	11.00%	8.64%	44.13%	25.53%
2007-2010	**Population**	**Housing Units**	**Vacant Units**	**Occupied Units**
PLACE	-0.77%	-0.50%	-2.09%	-0.28%
PLACE - 1 MILE	0.45%	1.06%	-1.97%	1.30%
1 - 3 MILE	0.43%	0.66%	-2.48%	0.91%
3 - 10 MILE	0.91%	1.25%	-1.78%	1.48%
10 MILE - MSA	1.03%	1.55%	-0.20%	1.72%
Totals	2.05%	4.02%	-8.52%	5.13%

Table 6: Annualized Percent Change in all Variables from 2000-2007 & 2007-2010

Population

From 2000 to 2010, the Dallas population grew throughout all spatial zones, however the pace was particularly accelerated in the non-core areas at an annual rate of 3.63% for the 3 – 10 mile area and 3.38% for the 10 mile - MSA zone. The core-areas grew at a relatively consistent rate to one another, with the place boundary growing the slowest at 1% per year. During the recession, all growth rates slowed drastically, however the non-core areas continued to have a faster growth rate than the core areas. The place boundary was the only area to experience decline in population at a rate of -0.77% per year.

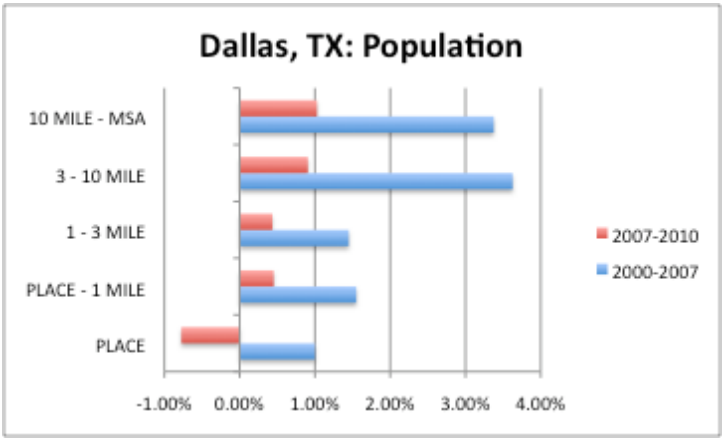


Figure 8: Annualized Percent Change in Population

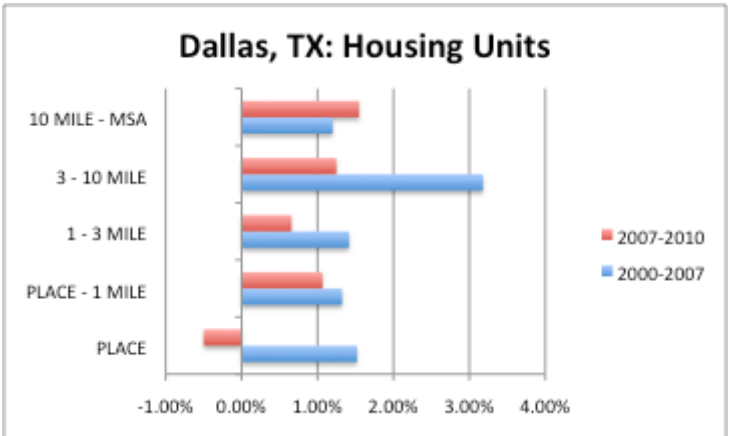


Figure 9: Annualized Percent Change in Housing Units

Housing Units

Similar to population, housing unit growth was seen across all spatial zones of the MSA from 2007 to 2010 as shown in Figure 13. This was particularly accelerated in the 3 – 10 mile zone, which had a positive growth rate of 3.18%. All other areas within the MSA grew over 1% per year. The recession saw a reduction in the growth rate of housing units, however this was not as drastic of a reduction as the population. Again, all areas continued to add housing units, except for the place boundary zone which lost -0.50% annually from a 1.52% growth rate in the previous period. The 10 mile - MSA zone was the only area to accelerate in housing unit growth during the recession from 1.2% to 1.55%

Vacant Units

From 2000 to 2007, vacant unit growth rates were particularly high with the core-areas increasing at a rate over 10% annually. The 10 mile - MSA zone's vacancy rate grew drastically slower than the other zones at 0.67% per year. During the recession, all growth in vacancy trends reversed and each spatial zone saw a decline in vacancy rates. The 10 mile - MSA zone saw the smallest decline at -0.20% per year. All other areas hovered around -2%.

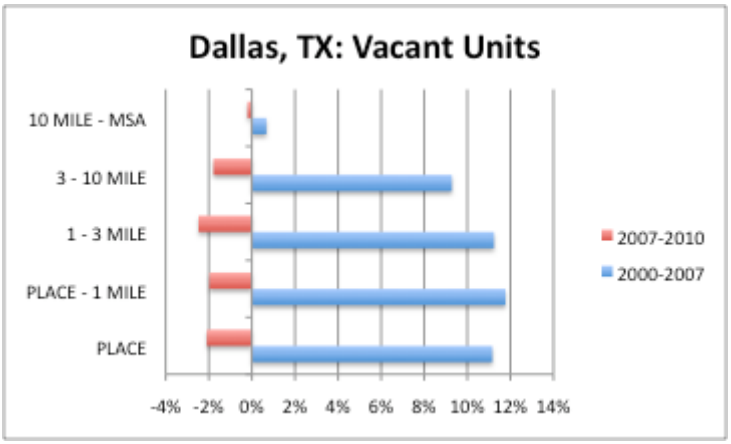


Figure 10: Annualized Percent Change in Vacant Units

Occupied Units

All spatial zones experienced a growth in occupied units from 2000 to 2007, however the 10 mile - MSA area grew at a drastically faster rate than all other areas at 20.66% per year. All core areas grew at rates below 1%. During the recession, the 10 mile – MSA zone drastically declined in pace to 1.72% annually. All other zones were relatively consistent during this time period. The core area as a whole did about the same with the place – 1 mile area being the only area to increase its rate of occupied units from 0.72% to 1.3%. However, this was offset by the place boundary decline in occupied units from 0.58% per year to -0.28%.

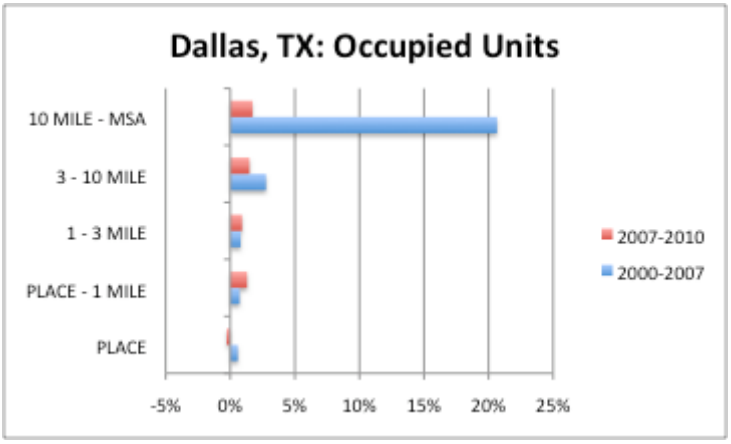


Figure 11: Annualized Percent Change in Occupied Units

Centralization Indicators

Table 7 shows the annualized percent change for each variable within the core and non-core variables and the results of indicator 1:

Population	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	201,280	8.90	1.23%	982,686	19.04	2.52%	1.29%
2007-2010	-33,645	-1.37	-0.46%	227,432	3.70	1.22%	1.68%

Housing Unit	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	94,399	10.67	1.46%	353,453	17.69	2.35%	0.90%
2007-2010	6,028	0.24	0.08%	150,612	6.41	2.09%	2.01%

Vacant Unit	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	54,627	111.01	11.26%	107,025	91.54	9.73%	-1.53%
2007-2010	-14,662	-14.12	-4.95%	-20,360	-9.09	-3.13%	1.82%

Occupied Unit	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	39,773	4.76	0.67%	246,428	13.10	1.77%	1.11%
2007-2010	20,690	2.36	0.78%	170,971	8.04	2.61%	1.83%

Table 7: Annualized Percent Change of the Non-Core less the Core

In both time periods of analysis, population in the Dallas MSA decentralized towards the non-core areas. This was more evident during the recession when the core areas had a declining change in population and the non-core areas continued to add population. This trend was also evident in housing unit growth, in which the non-core area experienced faster housing unit growth than the core areas in both periods. Decentralization, however, was faster during the recession since there was very little housing unit growth in the core areas. From 2000 to 2007, vacant units centralized, however both areas were rapidly increasing in vacant units. This trend reversed during the recession, and the core area declined in vacant units faster than the non-core. For the occupied units indicator, trends stayed stable throughout both periods with decentralization occurring over 1% per year.

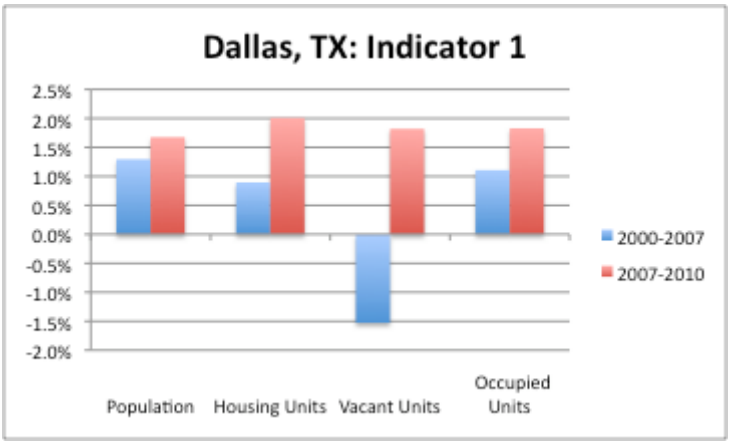


Figure 16: Annualized Percent Change of the Non-Core less the Core

Figure 17 shows that the core's share of housing units, vacant units, and occupied units declined from 2000 to 2007 to 2010. For population, this was a decline of 3.7 percentage points during the earlier period and 2 percentage points during the recession. The core's share of housing units showed similar patterns, losing 4.2 percentage points by 2007 and 2.2 percentage points during the recession. Occupied units showed the same trend at a loss of 3.3 percentage points from 2000 to 2007 and 2.1 through the recession. On the other hand, the core's share of vacant units increased from 42.1% in 2000 to 46.4% in 2007. During the recession this declined again to 43.8%, a 2.6 percentage point difference.

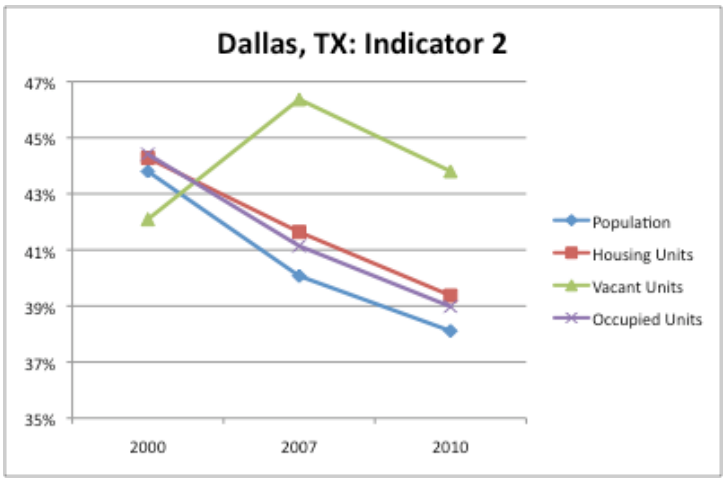


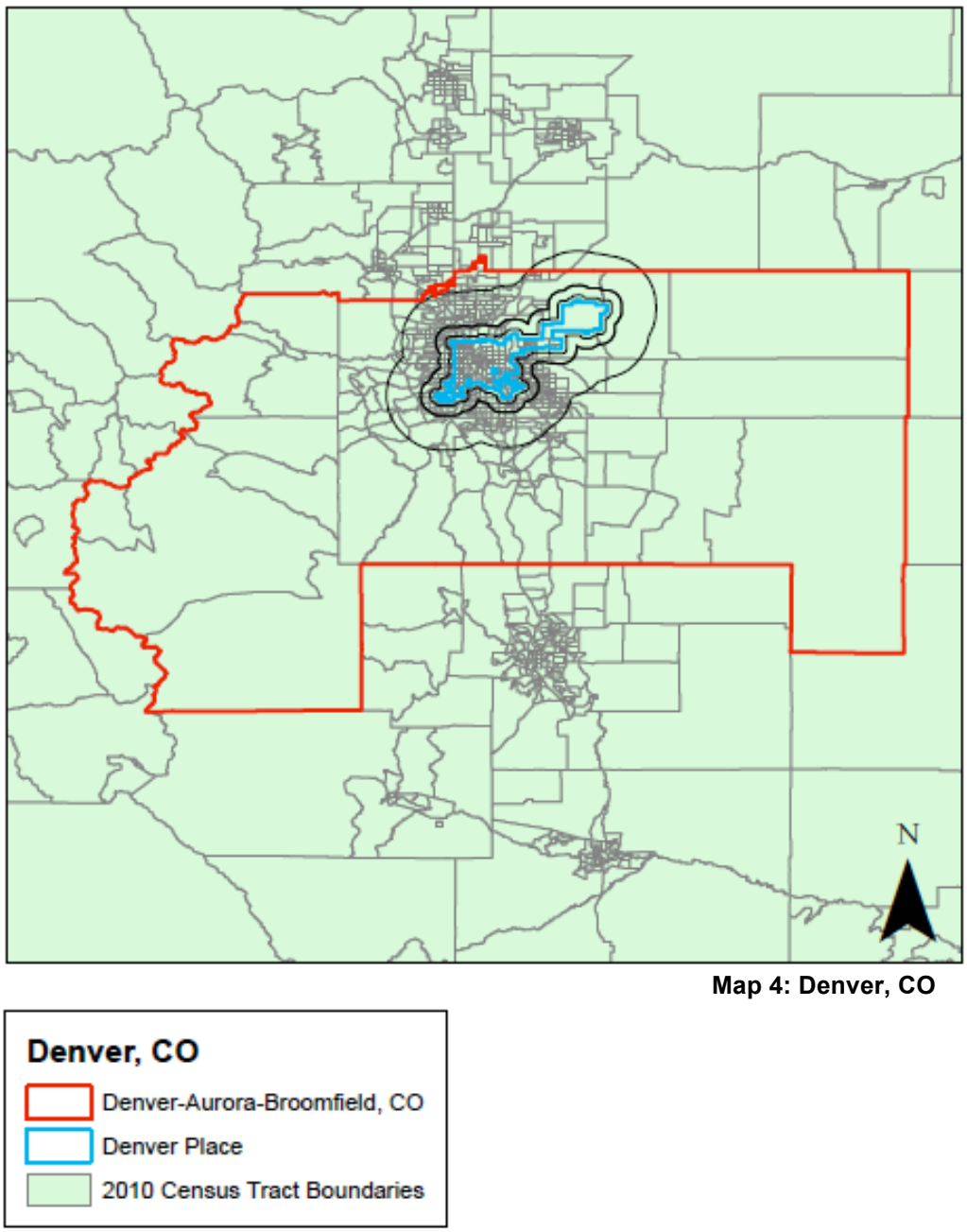
Figure 17: Core's share of all Variables form 2000-2010

Summary

During the recession, growth of all variables slowed considerably compared to rates experienced in the previous time period. This was particularly of note for vacant units, in which the growth reversed and began to decline during the recession. The rate of decentralization, accelerated for housing units, occupied units, and population. The vacant unit variable, which had previously been centralizing, also decentralized as the core began to lose vacant units faster than the non-core. While slightly slowing in rate, the core's share of all variables continued to decline through the recession. Overall, the Dallas MSA experienced widespread decentralization during the recession, more so than the previous period.

Denver, CO

Map 4 shows the spatial zones of analysis for the Denver, CO MSA:



Map 4: Denver, CO

Table 8 shows the annualized percent change in each variable for the 5 spatial zones within the Denver, CO MSA:

2000-2007	Population	Housing Units	Vacant Units	Occupied Units
PLACE	0.69%	1.24%	12.11%	0.45%
PLACE - 1 MILE	0.51%	1.24%	11.46%	0.66%
1 - 3 MILE	-0.13%	0.78%	15.42%	0.12%
3 - 10 MILE	2.31%	2.92%	15.87%	2.39%
10 MILE - MSA	4.26%	4.26%	4.13%	4.28%
Totals	7.64%	10.43%	58.99%	7.89%

2007-2010	Population	Housing Units	Vacant Units	Occupied Units
PLACE	0.45%	0.61%	-2.59%	0.93%
PLACE - 1 MILE	0.13%	-0.10%	-1.74%	0.03%
1 - 3 MILE	0.44%	0.25%	-2.31%	0.43%
3 - 10 MILE	0.70%	0.68%	-3.28%	0.90%
10 MILE - MSA	1.93%	2.16%	2.78%	2.08%
Totals	3.65%	3.59%	-7.14%	4.37%

Table 8: Annualized Percent Change of all Variables form 2000-2007 & 2007-2010

Population

For both period of analysis, Denver saw greater population growth rates in the non-core zones than the core area. Growth rates were faster for all areas from 2000 to 2007 than from 2007 to 2010 except for the 1 – 3 mile zone which had a slowly declining population from 2000 to 2007 at -0.13% per year. The 10 mile – MSA zone and the 3 – 10 mile zone saw more dramatic declines between the two time periods, however rates still stayed well above the core-area rates during the recession. The 10 mile - MSA boundary had a noticeably faster growth than all other spatial zones, maintaining a rate about double the 3 – 10 mile zone and more than four times all of the areas in both time periods.

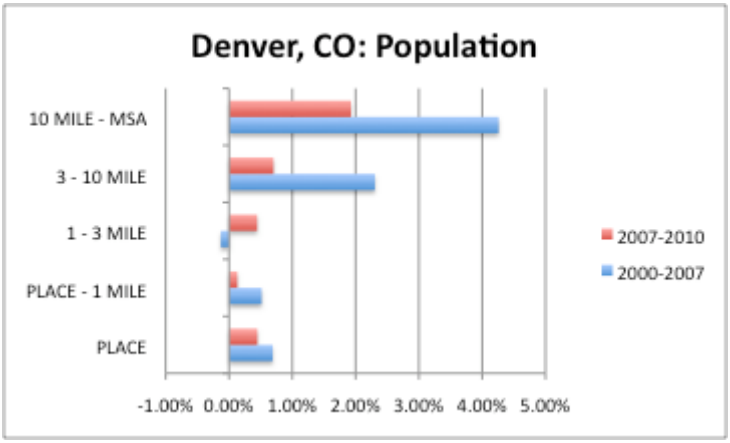


Figure 18: Annualized Percent Change in Population

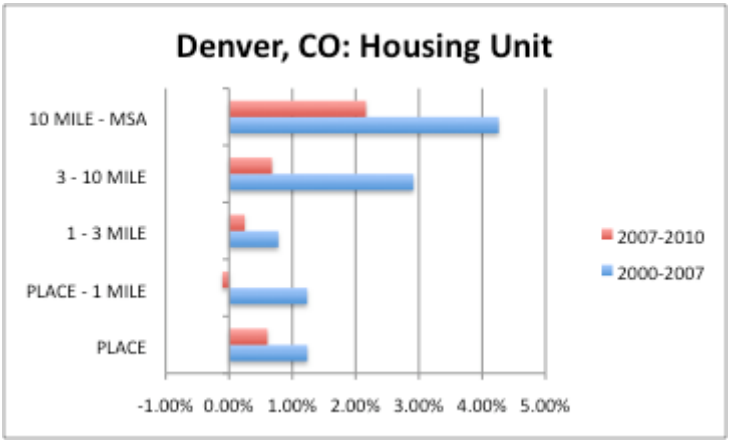


Figure 19: Annualized Percent Change in Housing Units

Housing Units

Housing unit growth trends were very similar to population patterns over both time periods. All

areas saw a faster growth of housing units from 2000 to 2007. The place – 1 mile zone was the only area to show a decline in housing units through the recession. Again, the non-core areas added housing units significantly faster than the core areas from 2000 to 2007. This pattern continued through the recession, however all rates of growth declined by at least half of the rates in the previous period.

Vacant Units

From 2000 to 2007, all spatial zones except for the 10 mile - MSA boundary experienced an annual rate of change in vacancy over 10%. The 10 mile – MSA zone also grew in vacant units, but the rate was much lower at 4.13%. This trend was largely reversed for all spatial zones except for the 10 mile - MSA zone during the recession. Zones showed a negative rate of vacancy with the 3 – 10 mile changing most dramatically from a 15.87% annual change in vacancy to a -3.28% annual rate during the latter time period. The 10 mile - MSA zone, however, only showed a slight decline in rate from 4.13% to 2.78%, therefore being the only area to continue to add vacant units through the great recession.

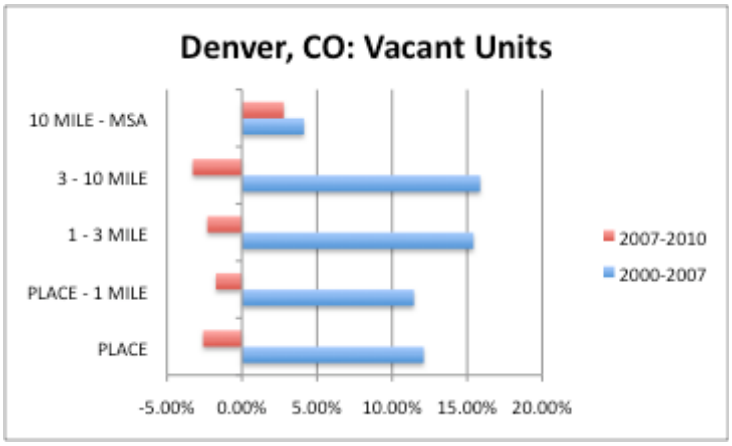


Figure 20: Annualized Percent Change in Vacant Units

Occupied Units

Consistent with other variables, the non-core area continued to show much faster rates of change from 2000 to 2007 than the other zones for the occupied units variable as shown in Figure 21. In this time period, the 10 mile - MSA zone experienced the fastest growth of occupied units at 4.28% but was followed by the 3 – 10 mile area at 2.39%. During the recession, rates declined significantly in the 10 mile - MSA and 3 – 10 mile zone, however they continued to be as fast or faster than the other zones. The place and 1- 3 mile zones were the only areas to increase in rate during the recession, however they remained below 1% per year at 0.93% and 0.43% respectively.

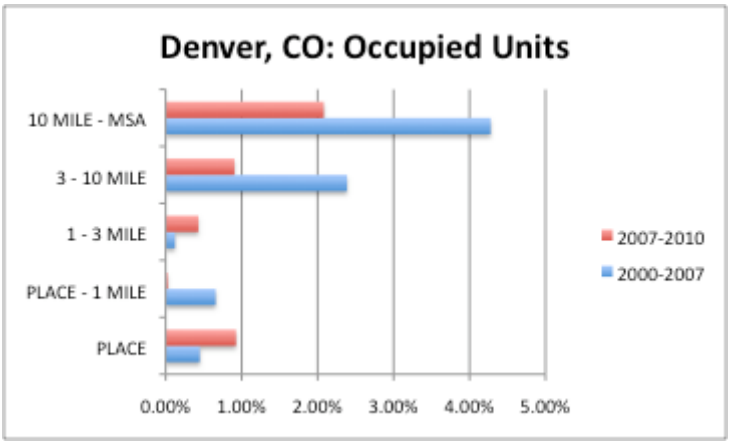


Figure 21: Annualized Percent Change in Occupied Units

Centralization Indicators

Table 9 shows the annualized percent change for each variable within the core and non-core variables and the results of indicator 1:

Population	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	32,409	2.78	0.39%	239,913	11.11	1.52%	1.12%
2007-2010	32,395	2.70	0.89%	119,345	4.97	1.63%	0.74%

Housing Units	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	39,986	7.97	1.10%	135,458	15.33	2.06%	0.96%
2007-2010	13,771	1.15	0.38%	50,464	4.95	1.62%	1.24%

Vacant Units	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	26,598	131.13	12.71%	44,061	114.24	11.50%	-1.22%
2007-2010	-7,232	-15.43	-5.43%	-8,813	-10.67	-3.69%	1.74%

Occupied Units	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	13,388	2.78	0.39%	91,397	10.82	1.48%	1.09%
2007-2010	21,003	4.24	1.39%	59,277	6.33	2.07%	0.67%

Table 9: Annualized Percent Change of the Non-Core less the Core

The first indicator shows that from 2000 to 2007, the non-core area of the Denver MSA grew faster in population than the core area by 1.12% annually. This continued to be the trend during the recession, however the rate accelerated for the core area more than the non-core area, effectively slowing decentralization. Housing units were also decentralizing, with the non-core area growing about double the rate of the core in housing units from 2000 to 2007. Both areas reduced the speed of housing unit growth during the recession, however decentralization became more apparent as the core slowed in housing unit growth more dramatically. Prior to the recession, the growth of vacant units slightly centralized as the core grew in vacant units 1.22% faster than the non-core area. The trend reversed through the recession, as the core-area saw a faster decline than the non-core area in vacant units. Through both time periods, occupied units decentralized. This decentralization slowed during the recession, since the core accelerated more dramatically in housing unit growth than the non-core area.

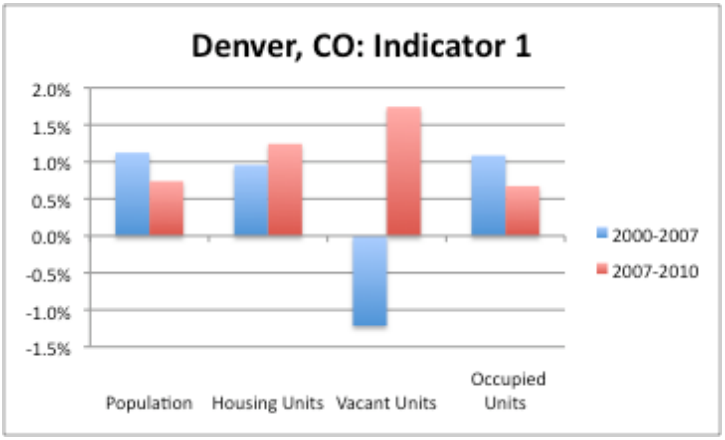


Figure 22: Annualized Percent Change of the Non-Core less the Core

According to the second indicator, as shown in Figure 23, the core's share of housing units, occupied units, and population dropped more dramatically from 2000 to 2007 than from 2007 to 2010. The core's share of occupied units showed the largest drop from 2000 to 2007, at 4.1 percentage points. From 2007 to 2010, all three variables showed a decline of 1.1-1.2 percentage points. The core's share of vacant units increased from 2000 to 2007 by 4.1 percentage points. This was quickly reversed by 2010, as the core's share of vacant units dropped back down from 56.7% to 53.7%.

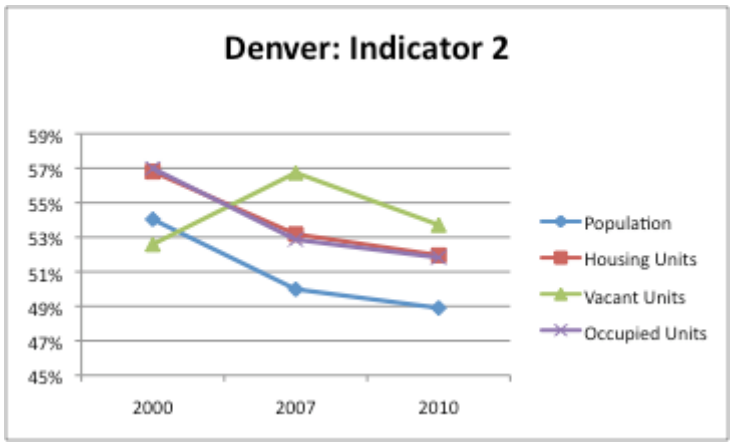


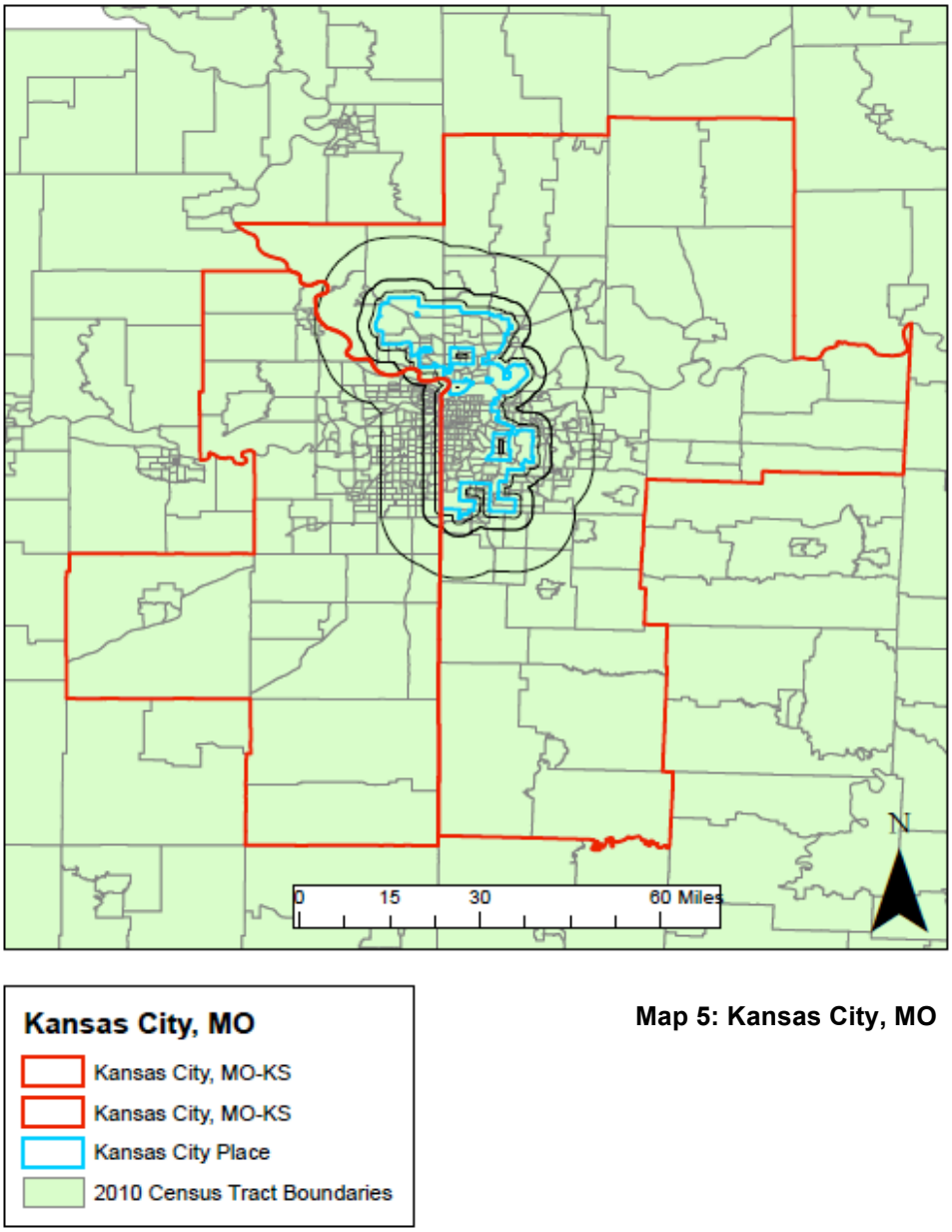
Figure 23: Core's Share of all Variables from 2000-2010

Summary

During the recession, the rates of growth for population, housing units, and occupied units slowed dramatically in the non-core areas, however they continued to see faster growth than the core. Vacant units saw the most dramatic reduction in pace, the MSA boundary was the only area to continue to increase in vacant units. The decentralization of population and occupied units slowed during the recession while the decentralization of housing units accelerated. Like most cities, vacant unit rates were declining faster in the core than the non-core from 2007 to 2010. Lastly, the core's share of all variables continued to decline during the recession, but the pace was reduced. Overall, while decentralization still occurred for the Denver MSA, the pace was slowed during the recession.

Kansas City, MO:

Map 5 shows the spatial zones of analysis for the Kansas City, MO MSA:



Map 5: Kansas City, MO

Table 10 shows the annualized percent change in each variable for the 5 spatial zones within the Kansas City, MO MSA:

2000-2007	Population	Housing Units	Vacant Units	Occupied Units
PLACE	0.97%	1.50%	7.71%	0.73%
PLACE - 1 MILE	0.51%	0.57%	8.18%	0.02%
1 - 3 MILE	1.22%	1.32%	6.39%	0.94%
3 - 10 MILE	1.33%	1.70%	8.27%	1.30%
10 MILE - MSA	2.02%	2.36%	5.24%	2.15%
Totals	6.04%	7.45%	35.79%	5.13%

2007-2010	Population	Housing Units	Vacant Units	Occupied Units
PLACE	-0.46%	-0.23%	-0.69%	-0.16%
PLACE - 1 MILE	0.00%	0.21%	0.29%	0.20%
1 - 3 MILE	0.16%	0.57%	1.60%	0.47%
3 - 10 MILE	0.13%	0.40%	-0.21%	0.44%
10 MILE - MSA	0.74%	0.92%	2.44%	0.79%
Totals	0.57%	1.87%	3.44%	1.74%

Table 10: Annualized Percent Change in all Variables from 2000-2007 & 2007-2010

Population

Population for every spatial zone showed positive growth from 2000 to 2007. The non-core zones experienced faster rates of growth than the core zones. Rates declined significantly for all zones during the recession, however population growth only became negative in the place boundary during the latter time period at -0.46% per year. The 10 mile – MSA boundary was the fastest growing spatial zone from 2000 to 2007 at 2.02%, and continued to be the fastest at 0.74% per year during the recession.

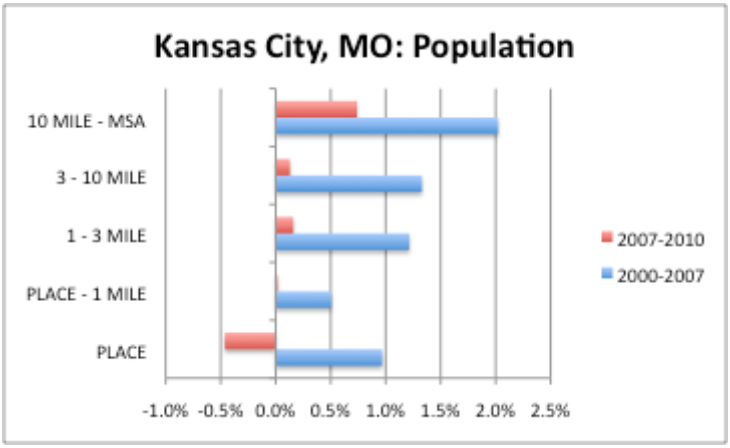


Figure 24: Annualized Percent Change in Population

Housing Units

Housing unit growth rates followed population trends for both time periods. From 2000 to 2007, rates accelerated faster in all spatial zones than from 2007 to 2010. Though there was a decline in housing unit rates during the recession, only the place boundary experienced a

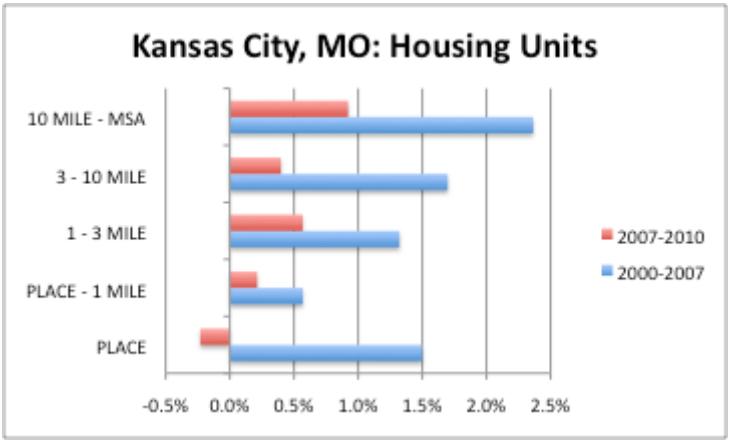


Figure 25: Annualized Percent Change of Housing Units

negative rate going from 1.5% to -0.23% per year. The non-core areas showed faster rates than the core areas for both time periods. As in the population variable, the 10 mile - MSA boundary had the greatest rate in both time periods at 2.15% from 2000 to 2007 and 0.79% from 2007 to 2010.

Vacant Units

Annual change in vacancy for the 2000 to 2007 period was quite high with the place, place - 1 mile, and 3 – 10 mile boundaries showing about 8% per year in increased vacancy. The 1 – 3 mile area was a bit slower at 6.39% and the MSA area was the slowest at 5.24%. All rates declined significantly through the recession, with some areas showing a reversal in direction as seen in Figure 26. While declining significantly from the previous period, the 10 mile - MSA boundary showed the highest rate of vacancy increases at 2.44% annually. This was a change from the previous time period in which the zone had the lowest rate. Both the 3 – 10 mile area and place boundary declined in vacancy during the recession at a rate of -0.21% and -0.69% per year respectively.

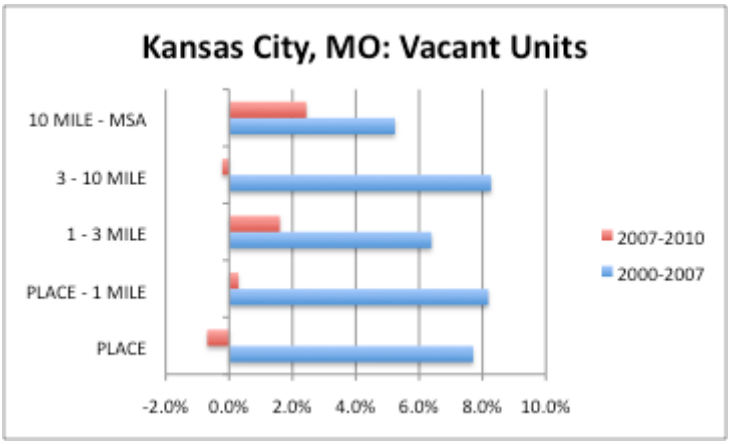


Figure 26: Annualized Percent Change in Vacant Units

Occupied Units

For occupied unit trends, the non-core area showed higher growth rates than the core area for both time periods. From 2000 to 2007, the 10 mile - MSA zone had the fastest growth rate at 2.15% and the place – 1 mile zone was the slowest at an annual rate of 0.02%. During the recession, all areas saw a decline in occupied unit growth, except for the place – 1 mile area, which accelerated slightly to a 0.2% annual rate. The place boundary was the only zone to show a negative occupied unit growth rate during the recession, but this was slow at -0.16%.

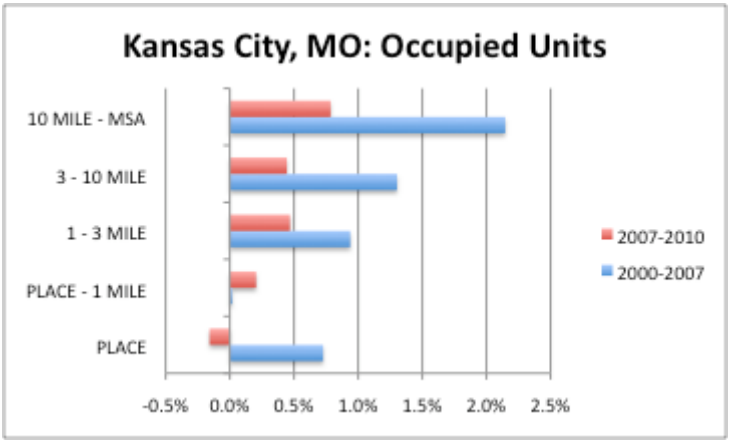


Figure 27: Annualized Percent Change in Occupied Units

Centralization Indicators

Table 11 shows the annualized percent change for each variable within the core and non-core variables and the results of indicator 1:

Population	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	57,883	6.79	0.94%	177,759	9.68	1.33%	0.39%
2007-2010	-11,619	-1.28	-0.43%	21,536	1.07	0.36%	0.78%

Housing Units	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	34,637	9.13	1.26%	92,621	12.07	1.64%	0.38%
2007-2010	2,297	0.25	0.08%	22,909	2.66	0.88%	0.80%

Vacant Units	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	18,782	65.95	7.50%	31,005	62.25	7.16%	-0.35%
2007-2010	-149	-0.32	-0.11%	2,648	3.28	1.08%	1.19%

Occupied Units	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	15,856	4.52	0.63%	61,616	8.58	1.18%	0.55%
2007-2010	2,446	0.67	0.22%	20,261	2.60	0.86%	0.64%

Table 11: Annualized Percent Change of the Non-Core less the Core

From 2000 to 2007, the Kansas City MSA population slightly decentralized by 0.39% per year. While the non-core area slowed in growth during the recession, the core area began to decline in population and therefore the indicator shows decentralization accelerated, as seen in Figure 28. Housing unit growth rates showed very similar trends for both time periods of analysis. The non-core area had a faster housing unit growth than the core area in both periods. Both areas slowed during the recession, however the core area slowed more dramatically and therefore decentralization accelerated. Growth of vacant units from 2000 to 2007 was slightly faster in the core area and therefore the indicator shows a centralization of vacant units by 0.35%. From 2007 to 2010, both the core and non-core areas slowed in vacant unit growth dramatically, with the core area showing a declining rate of vacant units. Vacancy decentralized during this time period, since the non-core continued to add vacant units at a 1.08% annual rate. In both time periods, occupied units decentralized further as the non-core area was growing faster than the core area.

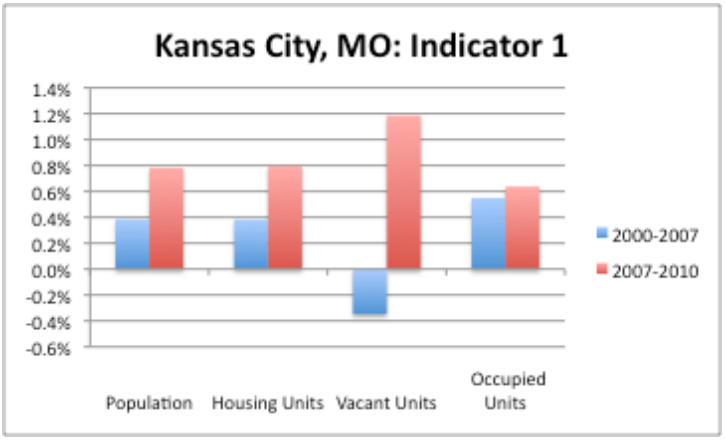


Figure 28: Annualized Percent Change of the Non-Core less the Core

The second indicator shows the core area lost share in population, housing units, and occupied units from 2000 to 2007 and then again from 2007 to 2010. This decline was relatively miniscule compared to other cities analyzed and the loss of core share slowed slightly during the recession. The core's share of vacant units increased from 2000 to 2007 from 57.2% to 58.5%, a 1.31 percentage point difference. During the recession, the core's share of vacant units reversed trends and declined to a lower share than 2000 at 56.4%.

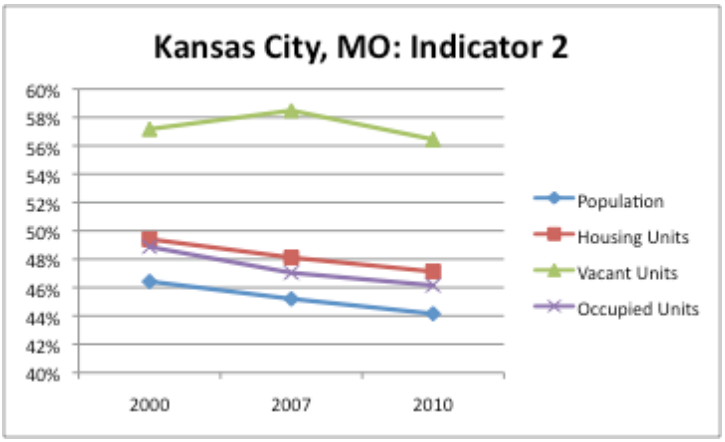


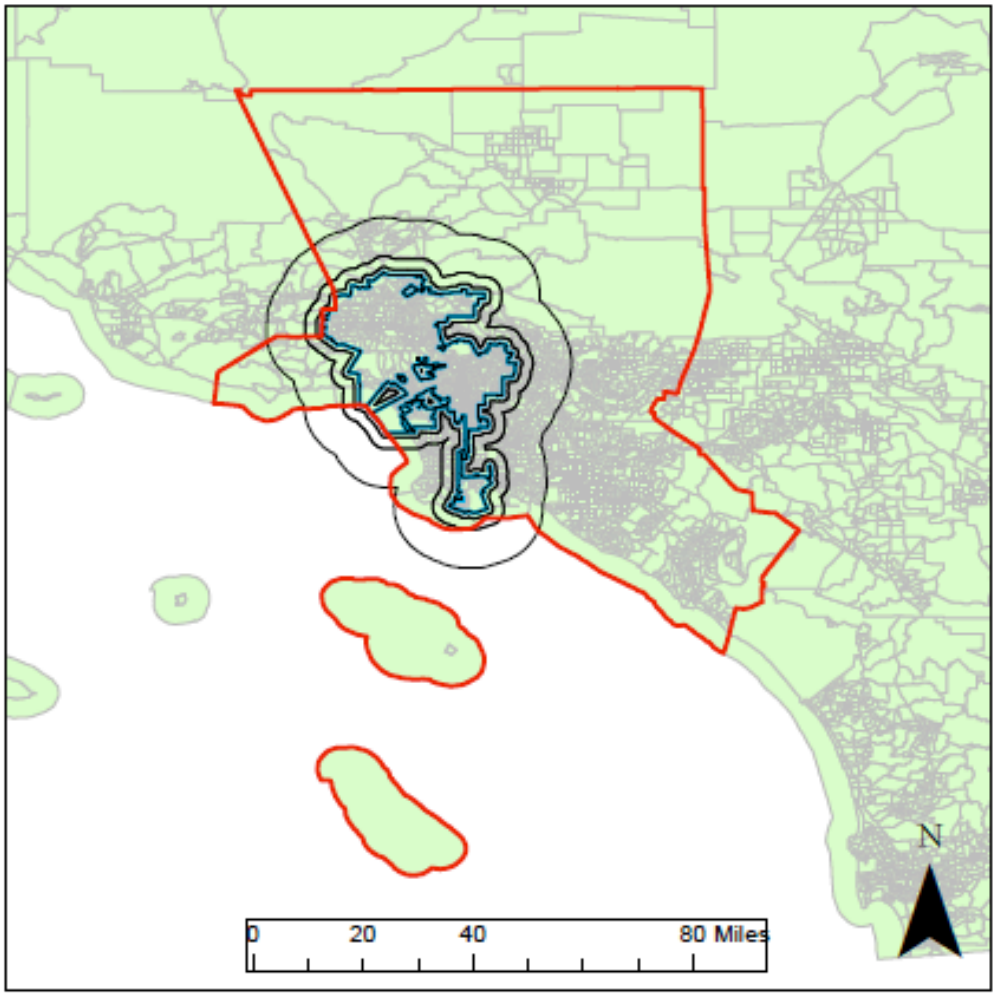
Figure 29: Core's Share of All Variables from 2000-2010

Summary

During the recession, growth of all variables slowed compared to rates leading up to 2007. For population, housing units, and occupied units, growth rates within the core were consistently slower than non-core areas from 2007 to 2010. Due to a greater slowing of the core, rates of decentralization accelerated for all variables. Interestingly, vacant units slightly declined in the core area during the recession, while they continued to grow in the non-core area. The core's share of all variables continued to decline through the recession, at a consistent speed. Overall, the Kansas City MSA experienced greater decentralization during the recession than the previous period, however this was relatively moderate.

Los Angeles, CA

Map 6 shows the spatial zones of analysis for the Los Angeles MSA:



Map 6: Los Angeles, CA

Table 12 shows the annualized percent change in each variable for the 5 spatial zones within the Los Angeles, CA MSA:

2000-2007	Population	Housing Units	Vacant Units	Occupied Units
PLACE	0.39%	0.50%	4.88%	0.26%
PLACE - 1 MILE	0.05%	0.19%	4.45%	-0.03%
1 - 3 MILE	0.26%	0.36%	4.84%	0.14%
3 - 10 MILE	0.48%	0.42%	5.90%	0.19%
10 MILE - MSA	0.60%	0.71%	5.93%	0.48%
Totals	1.78%	2.19%	26%	1.04%

2007-2010	Population	Housing Units	Vacant Units	Occupied Units
PLACE	-0.01%	0.29%	1.38%	0.22%
PLACE - 1 MILE	0.04%	0.21%	0.51%	0.19%
1 - 3 MILE	-0.02%	0.26%	0.42%	0.25%
3 - 10 MILE	0.11%	0.34%	-0.02%	0.36%
10 MILE - MSA	0.18%	0.36%	0.63%	0.34%
Totals	0.30%	1.46%	2.92%	1.36%

Table 12: Annualized Percent Change in All Variables form 2000-2007 & 2007-2010

Population

From 2000 to 2007, all spatial zones saw an increasing rate of population, however rates were all below 1%. The non-core areas had the fastest increasing population in this period, at 0.6% for the 10 mile - MSA and 0.48% for the 3 – 10 mile area. The place – 1 mile was the slowest growing zone with an annual rate of 0.05%. During the recession, all zones experienced declining growth rates, however the non-core area continued to outpace the core area. Both the 1 - 3 mile and place – 1 mile zones showed a slight decline in population in that time period at -0.02% and -0.01% respectively. While the other areas remained positive, rates were very low with the 10 mile - MSA boundary having the fastest annual rate at 0.18%.

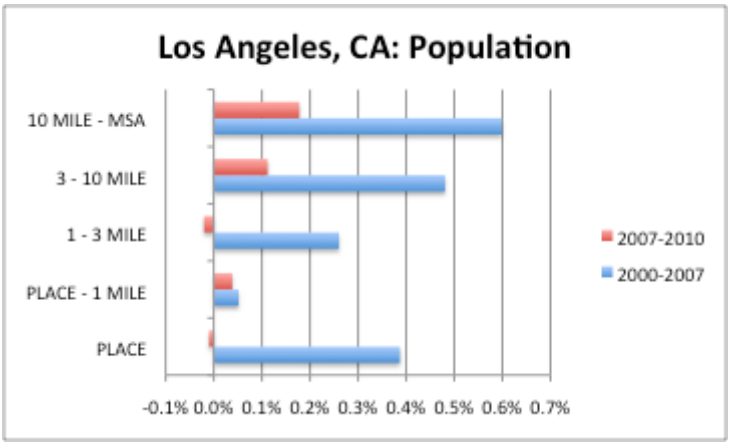


Figure 30: Annualized Percent Change in Population

Housing Units

Like population, all rates were relatively low to other cities, remaining under 1%. The 10 mile - MSA zone had the highest housing unit growth rate at 0.71% per year during this time period, followed by the place boundary at 0.5%. From 2007 to 2010, all rates declined somewhat consistently for each zone. The place – 1 mile was the only zone to show an increase in housing unit growth rates between the two time periods. While at a much smaller lead than from 2000 to 2007, the 10 mile - MSA boundary continued to see the fastest growth in housing units at 0.36%.

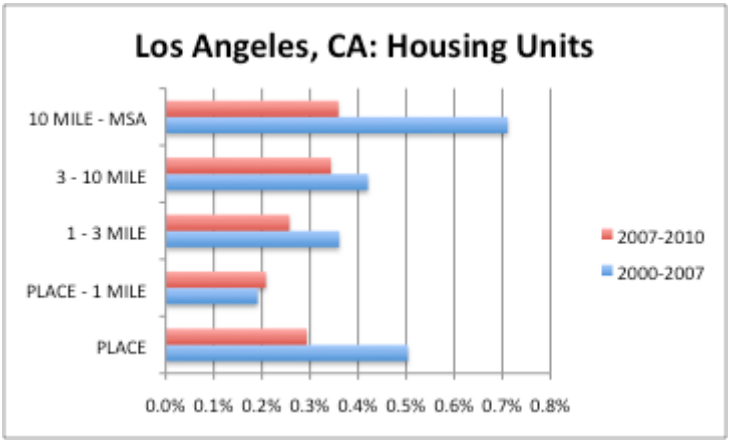


Figure 31: Annualized Percent Change in Housing Units

Vacant Units

All spatial areas saw a surge in vacant units from 2000 to 2007, averaging about 5% per year for the MSA. The non-core area experienced slightly faster rates of increasing vacant units at 5.93% for the 10 mile - MSA zone and 5.9% for the 3 – 10 mile zone. During the recession, all rates drastically declined. Most significantly, the 3 – 10 mile boundary declined from 5.9% per year to -0.02% per year during the recession, being the only zone to experience a negative rate. While significantly less than the earlier time period, the place boundary had the highest annual vacancy growth at 1.38%.

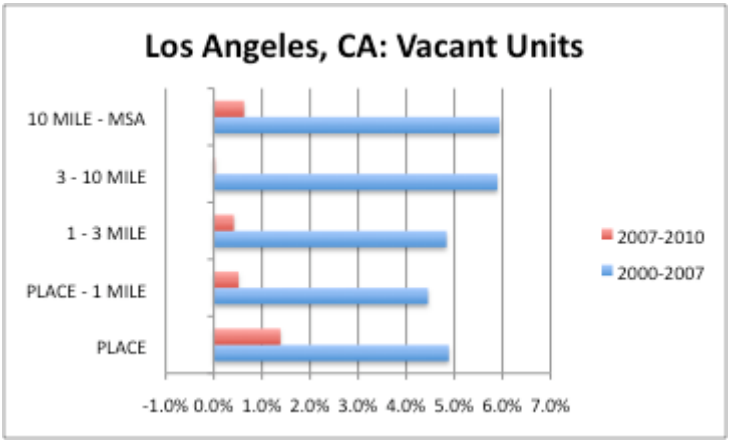


Figure 32: Annualized Percent Change in Vacant Units

Occupied Units

Similar to other variables, occupied unit growth rates were low for the Los Angeles, MSA. From 2000 to 2007, the 10 mile – MSA zone had the fastest growth of occupied units at 0.48% followed by the place boundary at 0.26%. The place – 1 mile zone was

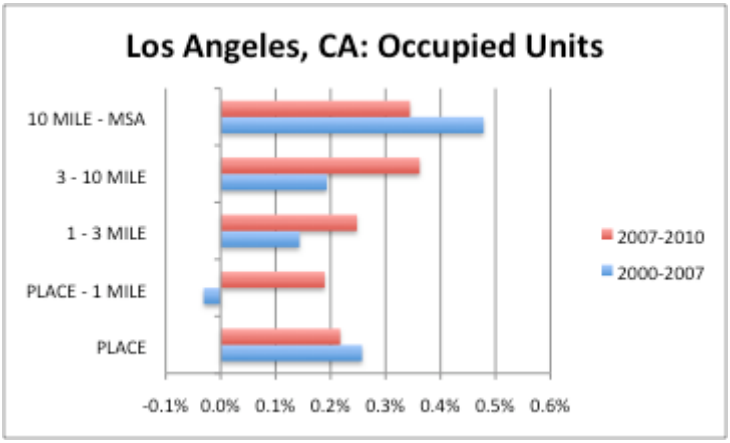


Figure 33: Annualized Percent Change in Occupied Units

the only area to see a declining rate of occupied units in that time period, but this was minimal at -0.03% per year. The 10 mile - MSA and place zones had the highest increases in occupied units from 2000 to 2007 but both experienced a slight decline in rates during the recession. The three other zones saw accelerated growth of occupied units, which was most significant for the place – 1 mile area, since it was experiencing a negative rate in the earlier period.

Centralization Indicators

Table 13 shows the annualized percent change for each variable within the core and non-core variables and the results of indicator 1:

Population	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	127,375	2.16	0.31%	390,953	3.13	0.44%	0.14%
2007-2010	-1,715	-0.03	-0.01%	74,089	0.58	0.19%	0.20%

Housing Units	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	418,366	23.80	3.10%	514,138	13.09	1.77%	-1.32%
2007-2010	41,774	0.69	0.23%	98,586	2.22	0.73%	0.50%

Vacant Units	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	36,909	38.89	4.80%	75,243	43.69	5.32%	0.51%
2007-2010	10,254	7.78	2.53%	13,821	5.59	1.83%	-0.70%

Occupied Units	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	26,369	1.31	0.19%	83,807	2.04	0.29%	0.10%
2007-2010	31,520	1.54	0.51%	84,765	2.02	0.67%	0.16%

Table 13: Annualized Percent Change in the Non-Core less the Core

The Los Angeles MSA experienced decentralizing population trends for both time periods. Both the core and non-core were growing in the earlier time period, however the non-core was growing faster. During the recession, both rates slowed but the core began to decline, slightly accelerating decentralization. Inconsistent with population, housing unit growth was centralizing from 2000 to 2007 with the core area growing 1.32% faster than the non-core

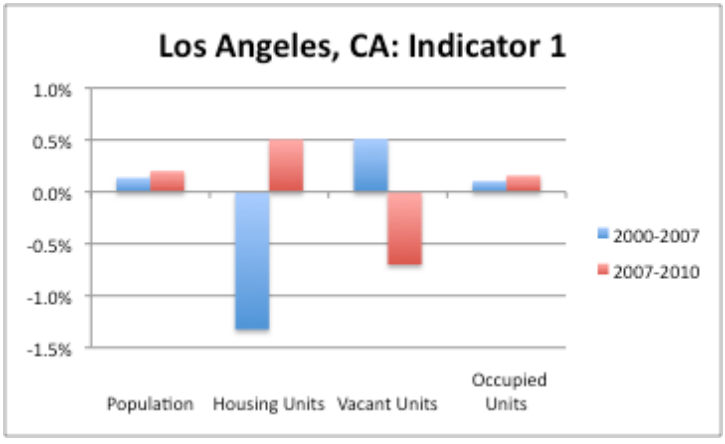


Figure 34: Annualized Percent Change for the Non-Core less the Core

area. This trend was reversed during the recession as both rates dramatically slowed and the non-core area began to grow faster than the core in housing units by 0.5%. Vacant unit growth was decentralizing from 2000 to 2007 for the Los Angeles MSA as the non-core area was growing in vacant units slightly faster than the core. Both rates slowed during the recession, however vacant units began to centralize with the core now growing faster than the non-core area. Occupied unit growth rates remained consistent during both periods, with slight decentralization as the non-core grew faster than the core by 0.1% and 0.16% respectively.

The second indicator, in Figure 35, shows that the core's share of both the population and occupied units declined slightly from 2000 to 2007 and then continued to decline from 2007 to 2010 but at a slower rate. The change was miniscule, however, especially relative to other cities previously analyzed. The core's share of housing units was inconsistent with these trends as it increased from 2000 to 2007 by 4.24%. While this dropped slightly by 0.14% during the recession, by 2010 the core's share of housing units was at 48.8% as opposed to 44.7% in 2000. The core's share of vacant units declined from 55.1% to 53.3% from 2000 to 2007 and then increased by 1.11% to 54.4% in 2010.

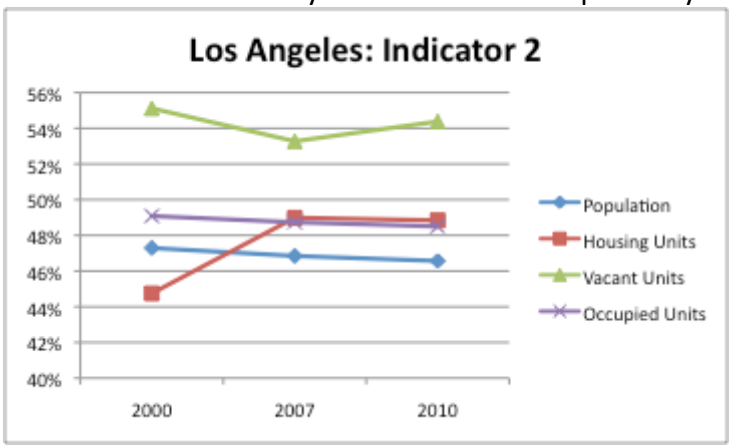


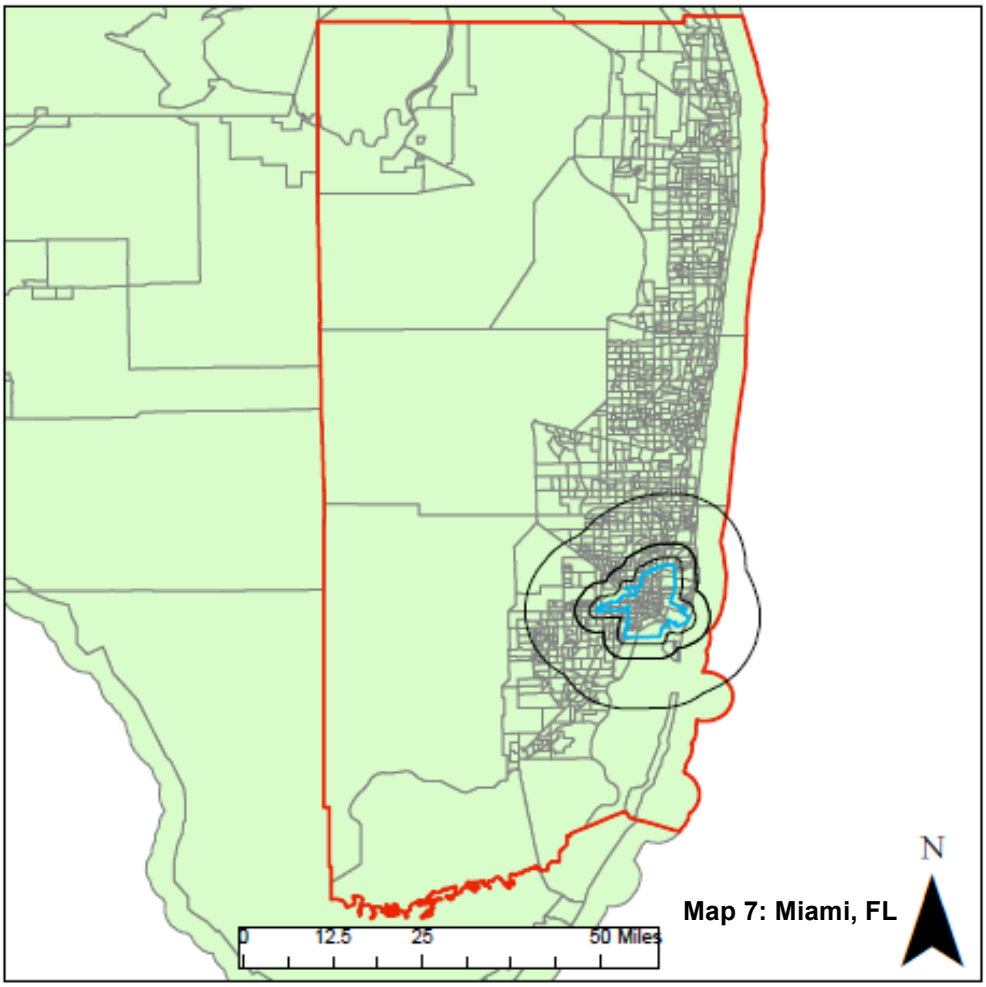
Figure 35: Core's Share of all Variables from 2000-2010

Summary

During the recession, population, housing unit, and vacant unit growth declined, with the vacant unit decline being particularly drastic from the previous period. Inconsistent with these trends, occupied units slightly increased from 2007 to 2010. Decentralization slightly accelerated for population, housing units, and occupied units. This was most dramatic for housing units since centralization was occurring leading up to the recession. Unlike most other cities, vacant unit growth began to centralize after slightly decentralizing leading up to 2007. During the recession, the core's share of population, housing units, and occupied units declined, however this was extremely slight. Overall, it is clear that decentralization accelerated during the recession, however except for housing unit growth, this acceleration was very miniscule.

Miami, FL

Map 7 shows the spatial zones of analysis for the Miami, FL MSA:



Map 7: Miami, FL

Miami, FL

- Miami
- Miami-Fort Lauderdale-Pompano Beach, FL
- 2010 Census Tract Boundaries

Table 14 shows the annualized percent change in each variable for the 5 spatial zones within the Miami, FL MSA:

2000-2007	Population	Housing Units	Vacant Units	Occupied Units
PLACE	2.11%	3.38%	10.76%	2.38%
PLACE - 1 MILE	-0.43%	0.85%	9.38%	-0.47%
1 - 3 MILE	-0.14%	0.37%	6.60%	-0.55%
3 - 10 MILE	0.74%	1.21%	7.37%	0.42%
10 MILE - MSA	1.68%	1.65%	6.43%	0.86%
Totals	3.97%	7.47%	40.55%	2.64%

2007-2010	Population	Housing Units	Vacant Units	Occupied Units
PLACE	-0.66%	-0.25%	-1.72%	0.01%
PLACE - 1 MILE	0.73%	0.52%	-1.66%	0.97%
1 - 3 MILE	0.30%	0.29%	-1.57%	0.62%
3 - 10 MILE	0.34%	0.33%	-1.85%	0.67%
10 MILE - MSA	0.23%	0.49%	-0.51%	0.69%
Totals	0.93%	1.38%	-7.31%	2.96%

Table 14: Annualized Percent Change in all Variables from 2000-2007 & 2007-2010

Population

From 2000 to 2007, both the place boundary and the non-core areas saw a positive increase in population. Population was growing at the fastest rate within the place boundary at 2.11% per year, but was followed by the 10 mile - MSA boundary at 1.68%. During this time period, the place – 1 mile and 1 – 3 mile spatial zones declined slightly in population at an annual rate of -0.43% and -0.14% respectively. During the recession, all areas that had been previously growing began to slow in pace. Most dramatically, the place boundary went from being the fastest growing area in the earlier period to having a negative growth rate of -0.66%. Conversely the place – 1 mile and 1 – 3 mile areas, which had previously been negative, began growing at a 0.73% and 0.3% annual rate.

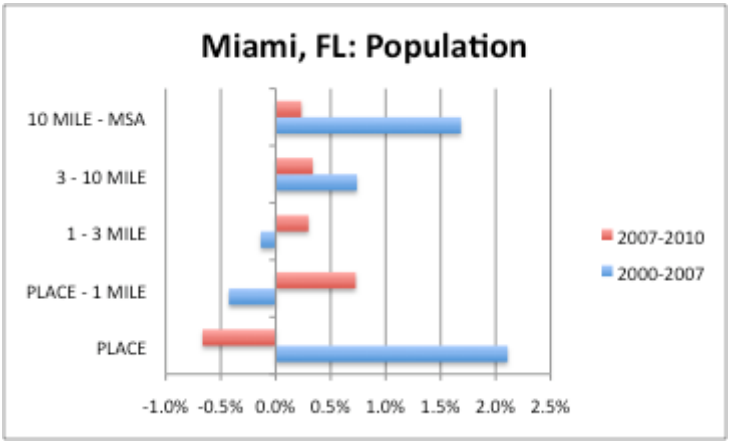


Figure 36: Annualized Percent Change in Population

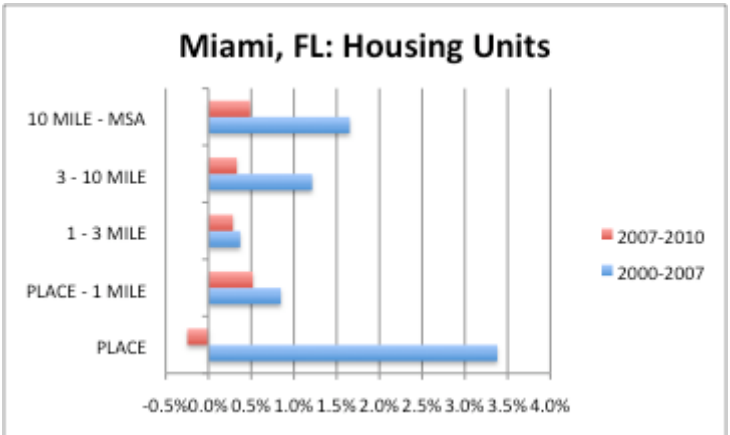


Figure 37: Annualized Percent Change in Housing Units

Housing Units

Unlike population growth, all spatial zones saw positive housing unit growth from 2000 to 2007 as seen in Figure 37. The place boundary grew in housing units more than double the 10 mile - MSA zone at 3.38% per year. The other core areas grew at a much slower rate at 0.85% for the place – 1 mile zone and 0.37% for the 1 – 3 mile zone. During the recession, all zones slowed in the growth of housing units to below 0.5% per year. Similar to the population trend, the place boundary went from being the fastest growth area to being the only area with declining housing units. This decline was minor, however, at -0.25% per year.

Vacant Units

From 2000 to 2007, all spatial areas saw very fast growth rates of vacant units. This was more prominent in the place – 1 mile and place boundary, which experienced about a 10% growth of vacant units per year. During the recession, all trends reversed and each spatial zone saw a declining rate of vacant units. Each rate remained above -2% with the 10 mile - MSA area having the slowest decline in vacant units at -0.51% per year.

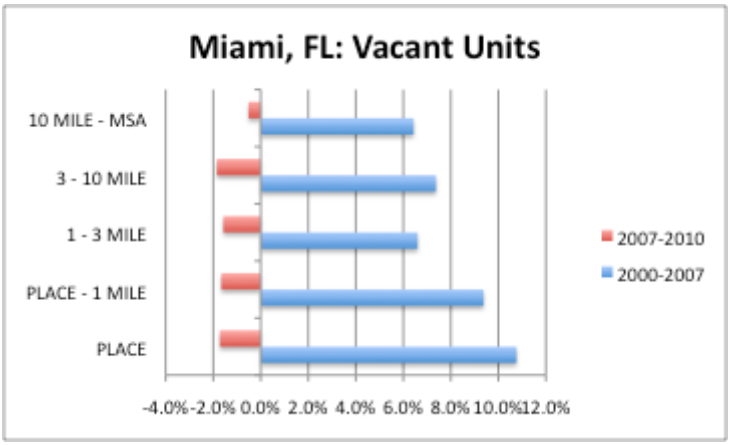


Figure 38: Annualized Percent Change in Vacant Units

Occupied Units

Again, the place boundary accelerated the fastest from 2000 to 2007, outpacing the other areas by more than double at 2.38% per year. This was the only area within the core to see positive occupied unit growth. Of the non-core areas, the 10 mile - MSA zone experienced faster growth at 0.86% compared to 0.42% for the 3 – 10 mile zone. During the recession, the 10 mile – MSA zone and place boundary were the only two zones to decline in rate. This was most dramatic for the place zone, which went from an annual gain of 2.38% to just 0.01% during the recession. The place – 1 mile and 1 – 3 mile boundaries, which had previously been negative, increased the most at a 0.97% and 0.62% annual rate.

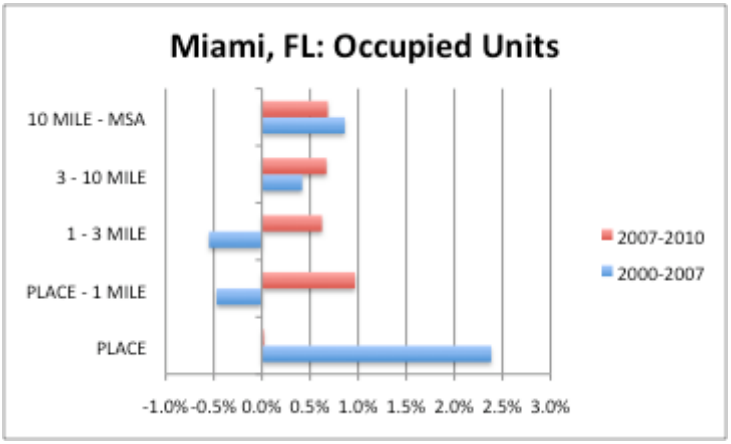


Figure 39: Annualized Percent Change in Occupied Units

Centralization Indicators

Table 15 shows the annualized percent change for each variable within the core and non-core variables and the results of indicator 1:

Population	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	49,277	5.53	0.77%	477,213	9.53	1.31%	0.54%
2007-2010	-3,897	-0.41	-0.14%	79,861	1.46	0.48%	0.62%

Housing Units	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	46,971	12.70	1.72%	248,795	11.57	1.58%	-0.15%
2007-2010	2,554	0.27	0.09%	65,874	2.75	0.91%	0.82%

Vacant Units	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	30,046	79.97	8.76%	147,266	60.27	6.97%	-1.79%
2007-2010	-7,433	-10.99	-3.81%	-24,830	-6.34	-2.16%	1.65%

Occupied Units	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	16,925	5.09	0.71%	101,529	5.33	0.74%	0.03%
2007-2010	9,987	2.86	0.94%	90,704	4.52	1.48%	0.54%

Table 15: Annualized Percent Change in the Non-Core less the Core

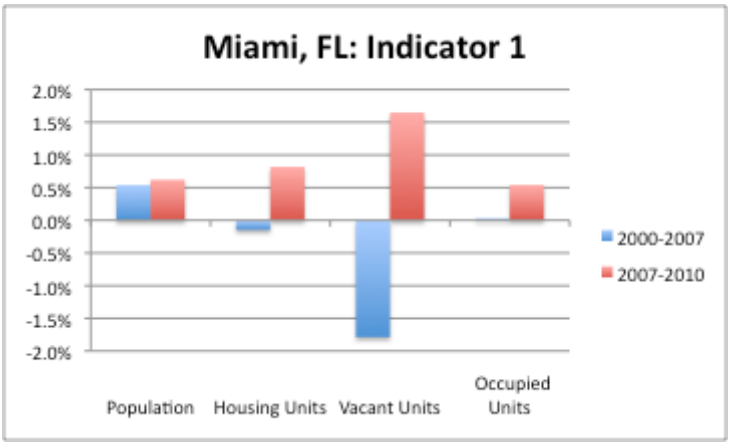


Figure 40: Annualized Percent Change in the Non-Core less the Core

For both time periods of analysis, population decentralized as the non-core area grew faster than the core area. During the recession, the core began to decline in population growth and therefore decentralization slightly accelerated. Housing unit growth slightly centralized from 2000 to 2007 with the core area growing 0.15% faster than the non-core. While both rates slowed during the recession, this was more drastic for the core-area and decentralization began to occur as the non-core grew faster than the core in housing units by 0.82%. Vacant units were growing quickly in both the non-core and core areas, however this was 1.79 percentage points faster in the core area and therefore centralization occurred. During the recession, vacant units declined in both areas. The decline of vacant units occurred faster in the core by 1.65%. Occupied unit growth decentralized during both time periods due to the non-core growing faster than the core, however this was miniscule from 2000 to 2007 with only a 0.03% difference.

As seen in Figure 41, Miami's core share of population and occupied units declined slightly during both time periods of analysis. However, for the population variable, the decline slowed during the recession, while the reduction in the core's share of occupied units accelerated slightly. The core's share of housing units grew from 2000 to 2007 by 0.17%, however in the latter time period this declined by -0.36%. The core's share of vacant units was most dramatic, growing 1.89% from 2000 to 2007 to 17.3%, but by 2010 the core's share was reduced to 16.4%.

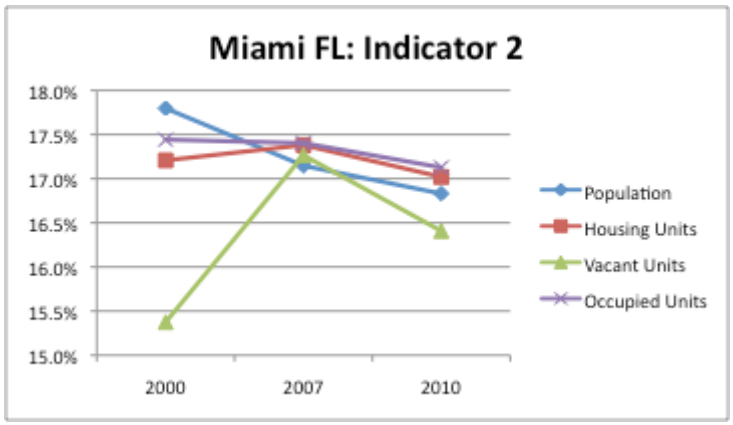


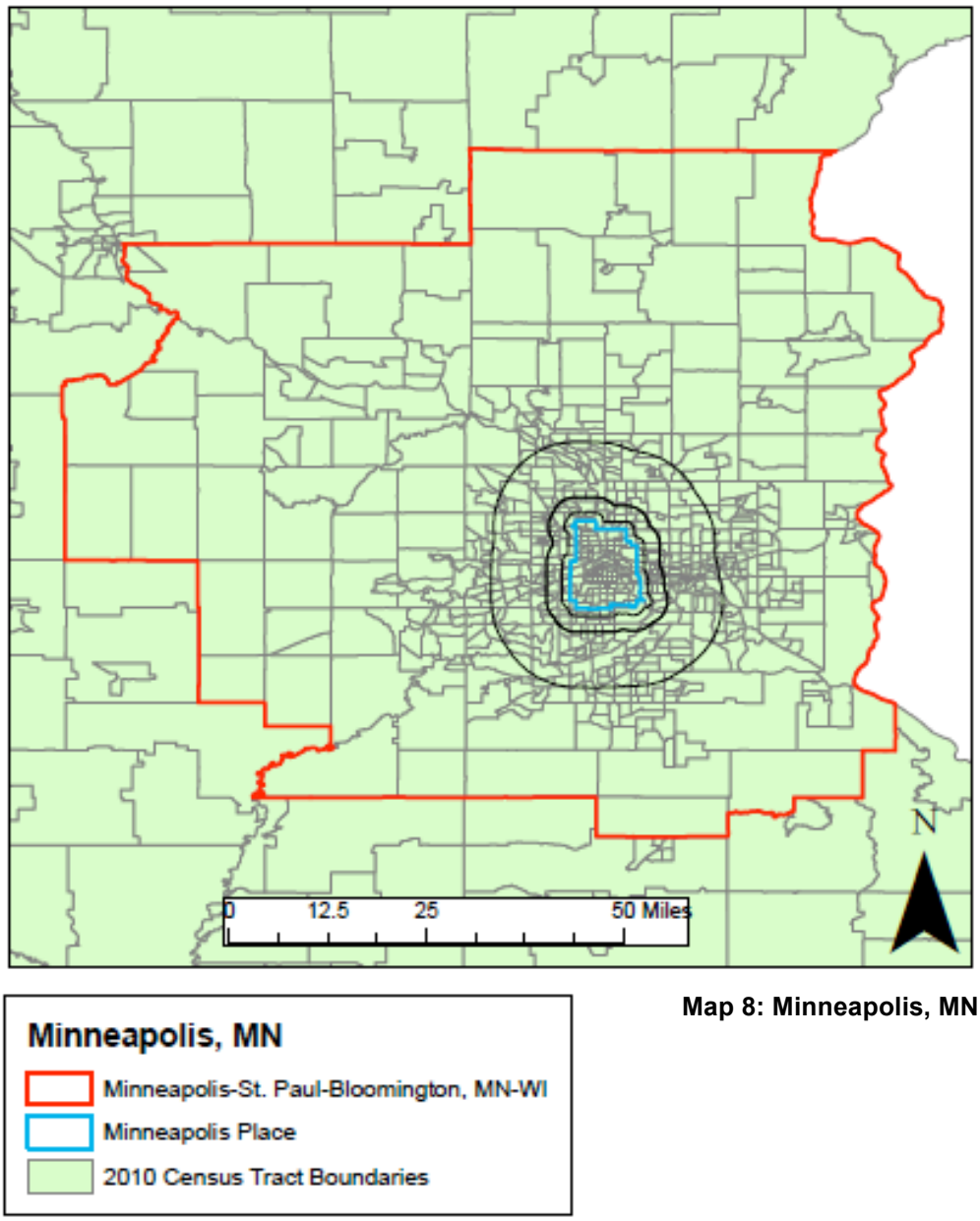
Figure 41: Core's Share of all Variables from 2000-2010

Summary

For the Miami MSA, population and housing unit growth declined during the recession. Vacant unit rates were the most drastic in change from the previous period, which were increasing rapidly up until 2007 and then declined through the recession. Inconsistent with these trends, occupied units slightly increased from 2007 to 2010. During the recession, decentralization accelerated for population, housing units, and occupied units. This was most dramatic for housing units since centralization was occurring previous to the recession. Vacant units were declining in the core faster than the non-core during the recession, indicating a decentralization of vacant units. The core's share of all variables declined during the recession. This was of particular interest for the housing unit and occupied unit variables, which were increasing in share within the core leading up to the recession. Overall, it seems that the recession was a turning point for Miami in which previous centralization tendencies were reversed and decentralization began to occur.

Minneapolis, MN

Map 8 shows the spatial zones of analysis for the Minneapolis, MN MSA:



Map 8: Minneapolis, MN

Table 16 shows the annualized percent change in each variable for the 5 spatial zones within the Minneapolis, MN MSA:

2000-2007	Population	Housing Units	Vacant Units	Occupied Units
PLACE	-0.11%	1.01%	14.01%	0.25%
PLACE - 1 MILE	-0.07%	0.26%	15.47%	-0.22%
1 - 3 MILE	-0.22%	0.00%	15.95%	-0.53%
3 - 10 MILE	-0.20%	0.76%	13.69%	0.30%
10 MILE - MSA	2.38%	3.16%	10.93%	2.84%
Totals	1.77%	5.19%	70.05%	2.63%

2007-2010	Population	Housing Units	Vacant Units	Occupied Units
PLACE	0.11%	-0.21%	-0.91%	-0.14%
PLACE - 1 MILE	0.43%	0.66%	4.29%	0.44%
1 - 3 MILE	0.36%	0.54%	2.35%	0.43%
3 - 10 MILE	0.28%	0.32%	1.38%	0.25%
10 MILE - MSA	0.42%	0.43%	1.04%	0.40%
Totals	1.59%	1.75%	8.14%	1.38%

Table 16: Annualized Percent Change of all Variables from 2000-2007 & 2007-2010

Population

Except for the 10 mile - MSA boundary, Minneapolis showed a declining rate of population from 2000 to 2007 for all spatial zones. Population rates were all above -0.5%, however, and therefore decline was slow. The 10 mile - MSA boundary was an outlier in this case, showing a positive population growth of 2.38% per year. During the recession, this zone slowed in population growth to 0.42%. All other zones, which had previously been negative, began to increase in population. Again, all rates were below 0.5%.

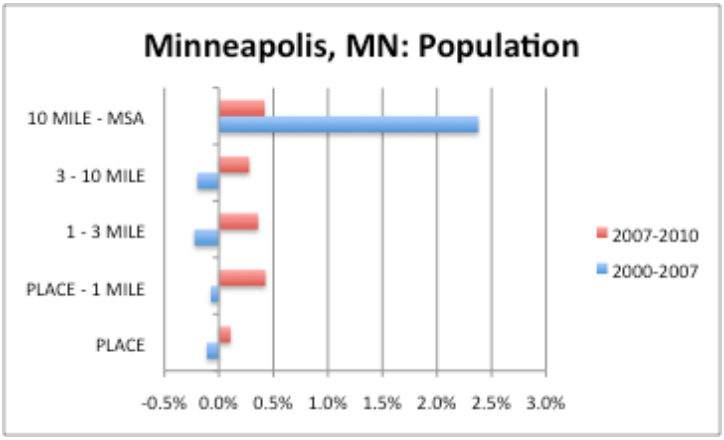


Figure 42: Annualized Percent Change in Population

Housing Units

Housing unit growth trends from 2000 to 2007 were similar to population for the 10 mile - MSA boundary, which were three times faster than every other zone at 3.16% annually. Unlike population rates, the

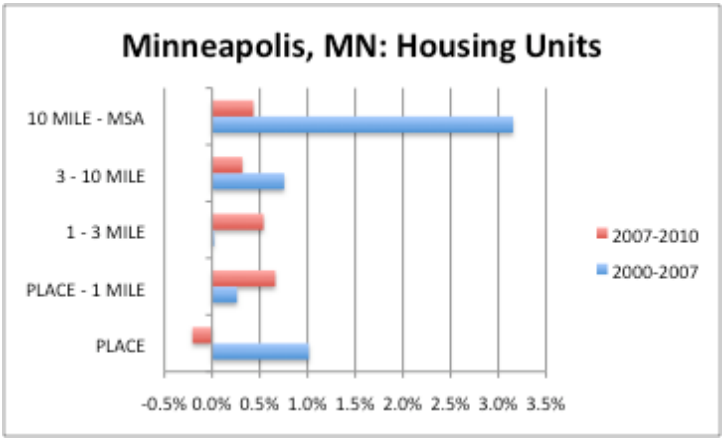


Figure 43: Annualized Percent Change in Housing Units

place boundary saw a positive growth of housing units in this time period at 1.01%. The 1 – 3 mile was the only area that did not show a positive growth in population, however its rate was at 0%, indicating no change. During the recession, all growth rates were below 1%. The 1 – 3 mile and place – 1 mile areas were the only zones to pick up speed in housing unit growth but this remained slight at 0.54% and 0.66% respectively. The 10 mile - MSA boundary saw the most dramatic reduction in its rates, from 3.16% to 0.42%.

Vacant Units

From 2000 to 2007, all zones within Minneapolis saw rapidly increasing vacant unit rates. The core areas were the highest with the 1 – 3 mile and place – 1 mile zones reaching over 15%. The 10 mile - MSA boundary was the slowest growing zone, but still saw rapid growth of vacant units at 10.93%. All rates declined significantly in the latter time period, however the place boundary was the only zone to see a negative vacant unit rate at -0.91%. The place – 1 mile and 1 mile – 3 mile zones were the fastest growing during the recession at 4.29% and 2.35% respectively. These rates were significantly higher than other cities analyzed.

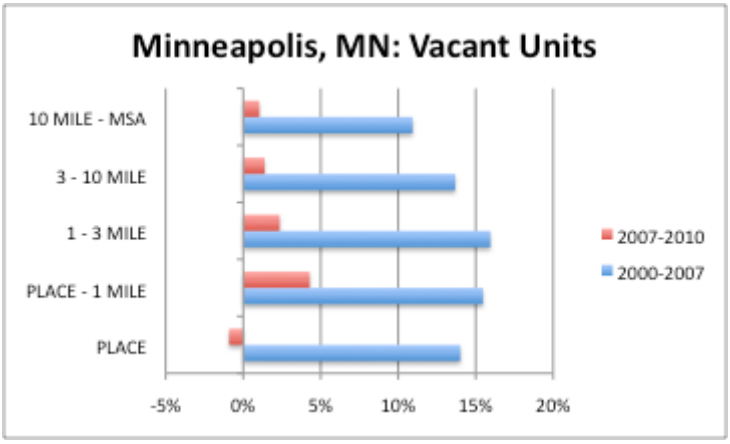


Figure 44: Annualized Percent Change in Vacant Units

Occupied Units

Similar to housing unit and population trends, the 10 mile - MSA boundary experienced the highest growth rate for occupied units, more than four times the other spatial zones from 2000 to 2007. The place – 1 mile and 1 – 3 mile zones were the only boundaries to lose occupied units in this time period, which occurred at a -0.22% and -0.53% annual rate respectively. During the recession, these two boundaries reversed trends showing a positive growth rate of occupied units, however all other areas slowed. This was most drastic for the 10 mile - MSA boundary, which was reduced from 2.84% to just 0.4% per year. The place boundary was the only declining rate for occupied units during the recession but this was slight at -0.14%.

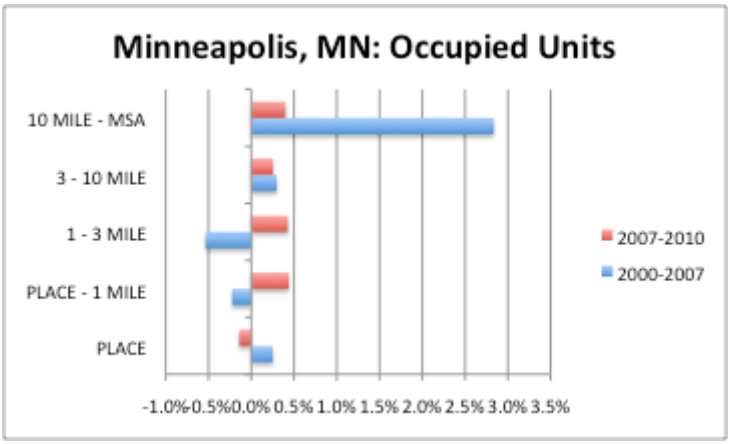


Figure 45: Annualized Percent Change in Occupied Units

Centralization Indicators

Table 17 shows the annualized percent change for each variable within the core and non-core variables and the results of indicator 1:

Population	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	-6,970	-0.98	-0.14%	212,365	7.40	1.03%	1.17%
2007-2010	11,642	1.65	0.55%	73,258	2.38	0.79%	0.24%

Housing Units	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	13,106	4.21	0.59%	143,402	12.67	1.72%	1.13%
2007-2010	3,445	0.49	0.16%	29,439	2.31	0.76%	0.60%

Vacant Units	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	14,457	159.39	14.59%	42,013	132.00	12.78%	-1.81%
2007-2010	843	3.58	1.18%	5,142	6.96	2.27%	1.09%

Occupied Units	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	-1,351	-0.45	-0.06%	101,389	9.22	1.27%	1.33%
2007-2010	2,602	0.86	0.29%	24,297	2.02	0.67%	0.38%

Table 17: Annualized Percent Change in the Non-Core less the Core

From 2000 to 2007, the core area declined slightly in population while the non-core area grew at 1.03% annually and therefore population largely decentralized in the earlier time period as shown in Figure 46. This decentralization continued through the recession, but slowed from a rate of 1.17% to 0.24%. This was due to the core area growing in population while the non-core area slowed. Consistent with population, housing unit growth decentralized in both time periods and slowed during the recession due to the non-core area slowing in housing unit growth more dramatically than the core area. Vacant unit growth was particularly rapid in both the non-core and core areas of the Minneapolis MSA from 2000 to 2007. Vacant units slightly centralized however, since the core area was growing faster. Both areas slowed dramatically in the growth of vacant units during the recession, with vacant units beginning to decentralize since the non-core had a growth rate 1.09% faster than the core area. Occupied units decentralized during both periods of analysis. From 2000 to 2007, the core area was declining in occupied unit growth while the non-core was increasing at an annual rate of

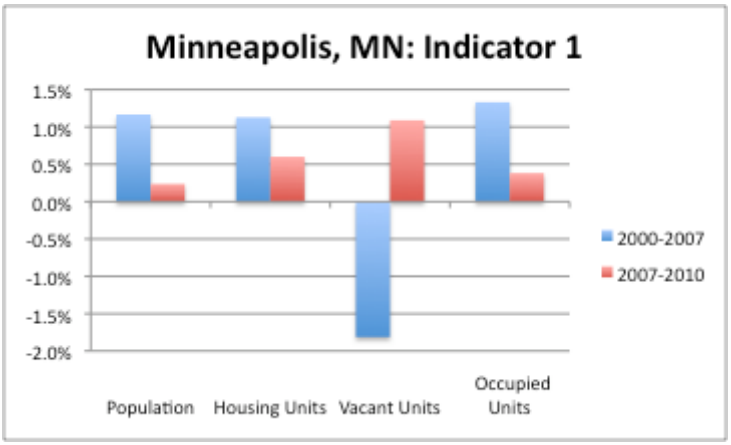


Figure 46: Annualized Percent Change in the Non-Core less the Core

1.27%. While the core area picked up speed in occupied unit growth from 2007 to 2010 and the non-core slowed, the non-core continued to grow faster by 0.38%.

Minneapolis's core share of population, housing units, and occupied units declined from 2000 to 2010. This decline was more rapid, however, from 2000 to 2007 for all variables. Decline from 2000 to 2007 was most dramatic for the core's share of occupied units, which was reduced by 2.43%. In the latter time period, this slowed by a loss of .28% for a total loss of 2.72%. The core's share of vacant units increased from 2000 to 2007 by 3.36% going from 28.5% of the share to 31.9%. By 2010, this was reduced to a core share of 30.9%.

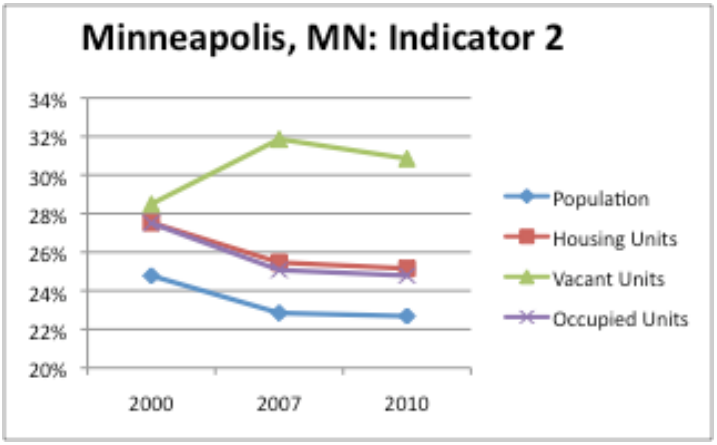


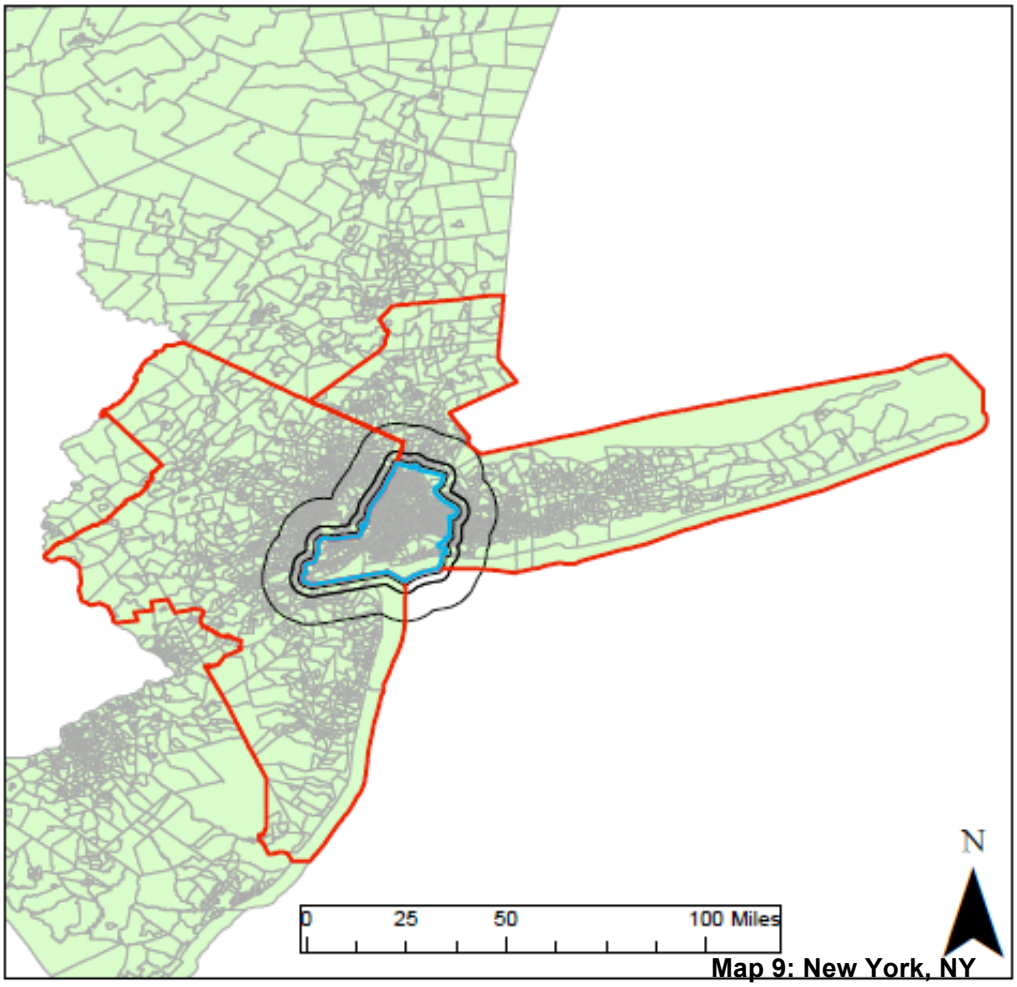
Figure 47: Core's Share of all Variables from 2000-2010

Summary

Previous to the recession, much of the growth in population, housing units, and occupied units was skewed towards the non-core area because the MSA boundary had dramatically higher growth rates than any other area. During the recession, some rates declined while others accelerated but the MSA boundary no longer was an outlier. Most noticeably, vacant unit rates dramatically declined during the recession. Decentralization slowed during the recession for all variables, mostly because the non-core area declined faster in growth than the core area. This was particularly evident for vacant unit growth, which had been centralizing leading up to 2007. The core's share of all variables declined during the recession, however except for the vacant units variables, this was a slower decline than the previous period. Overall, slight decentralization occurred during the recession, but this remained minimal because the core area accelerated slightly in population and occupied units while the non-core area only declined.

New York, NY

Map 9 shows the spatial zones of analysis for the New York, NY MSA:



Map 9: New York, NY

New York City, NY

- New York Place
- New York-Northern New Jersey-Long Island, NY-NJ-PA
- New York-Northern New Jersey-Long Island, NY-NJ-PA
- 2010 Census Tract Boundaries

Table 18 shows the annualized percent change in each variable for the 5 spatial zones within the New York, NY MSA:

2000-2007	Population	Housing Units	Vacant Units	Occupied Units
PLACE	.52%	.56%	6.71%	.12%
PLACE - 1 MILE	.24%	.71%	11.11%	.05%
1 - 3 MILE	.02%	.63%	10.70%	.04%
3 - 10 MILE	.01%	.32%	9.48%	-.15%
10 MILE - MSA	.62%	.64%	4.27%	.34%
Totals	1.40%	2.30%	36%	0.40%

2007-2010	Population	Housing Units	Vacant Units	Occupied Units
PLACE	-.22%	.18%	-1.10%	.29%
PLACE - 1 MILE	.95%	1.22%	.14%	1.32%
1 - 3 MILE	.29%	.29%	-.62%	.36%
3 - 10 MILE	.12%	.21%	-.69%	.27%
10 MILE - MSA	.10%	.43%	.52%	.42%
Totals	1.24%	2.32%	-1.76%	2.67%

Table 18: Annualized Percent Change in all Variables from 2000-2007 & 2007-2010

Population

The rate of population change was positive for all spatial zones within the New York MSA from 2000 to 2007, however all rates were below 1%. The 10 mile - MSA boundary and the place boundary had the fastest rates at 0.62% and 0.52%. During the recession, these two boundaries were the only areas to slow in growth with the place boundary being the only declining area at -0.22% per year. While all other rates accelerated in the latter time period, they remained below 1% with the place – 1 mile zone experiencing the fastest rate at 0.95%.

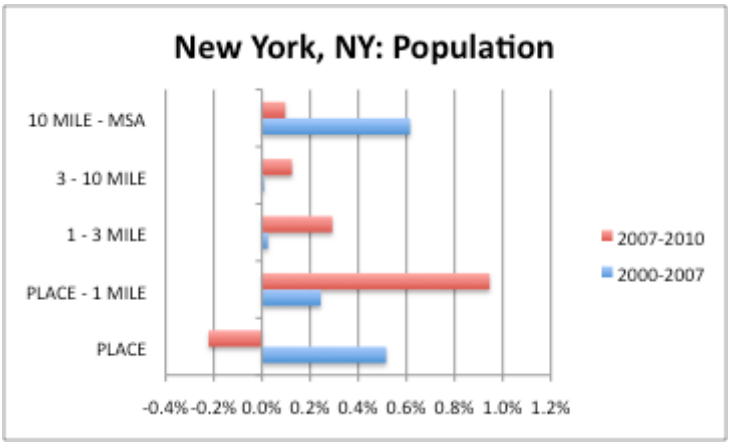


Figure 48: Annualized Percent Change in Population

Housing Units

Consistent with population trends, all housing unit rates from 2000 to 2007 were positive, but remained below 1%. The place – 1 mile area had the highest rate at 0.71% but all other spatial zones were close behind. From 2007 to 2010, the

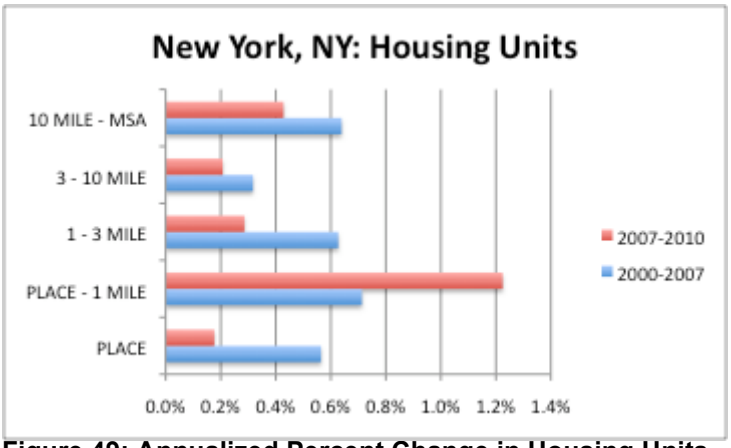


Figure 49: Annualized Percent Change in Housing Units

non-core areas all slowed in housing unit rates. The core areas also slowed during the recession except for the place – 1 mile area, which was the fastest growing rate at 1.22%.

Vacant Units

From 2000 to 2007, all spatial zones experienced high vacant unit growth. The core area held the two highest rates, with both the place – 1 mile and the 1 – 3 mile boundaries experiencing growth beyond 10%. The 10 mile - MSA boundary had the slowest growth rate for vacant units, however the rate was still high at 4.27%. During the recession, all rates declined significantly. The place boundary, 1 – 3 mile, and 3 – 10 mile areas all showed negative growth in vacant units, with the place boundary experiencing the fastest declining rate of -1.1% per year.

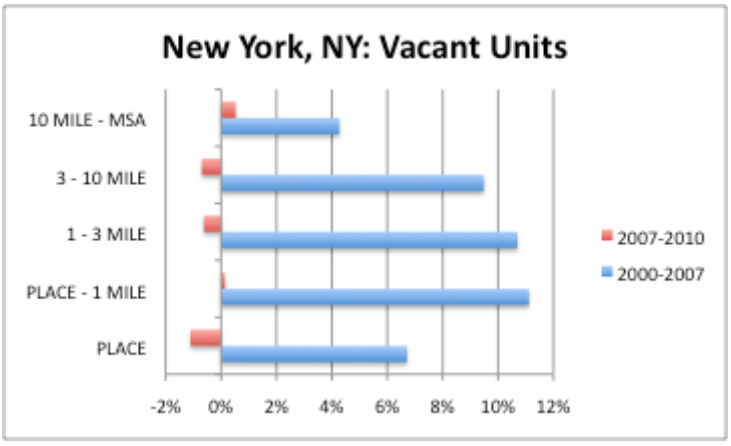


Figure 50: Annualized Percent Change in Vacant Units

Occupied Units

From 2000 to 2007, very little growth occurred for occupied units. The fastest growing area was the 10 mile - MSA boundary at 0.34%. The place – 1 mile area was the only area that saw a loss in occupancy in this time period at -0.15%. During the recession, all spatial areas accelerated in the growth of occupied units. This was most dramatic in the place – 1 mile zone, which increased from 0.05% to 1.32%. All other rates were below 0.5%.

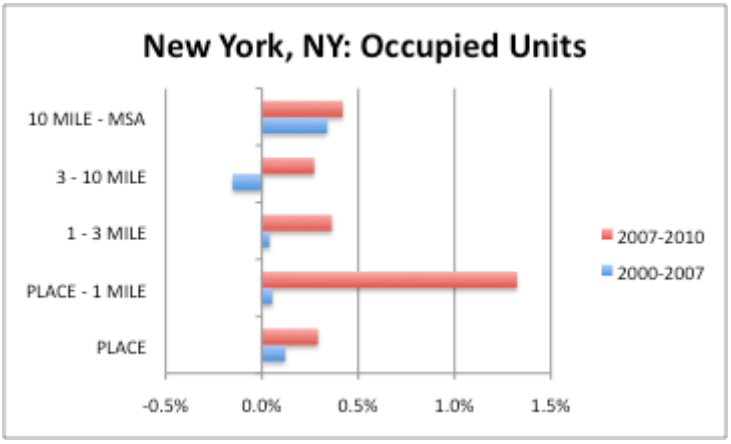


Figure 51: Annualized Percent Change in Occupied Units

Centralization Indicators

Table 19 shows the annualized percent change for each variable within the core and non-core variables and the results of indicator 1:

Population	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	301,625	3.19	0.45%	572,010	3.13	0.44%	-0.01%
2007-2010	-81,515	-0.84	-0.28%	-14,535	-0.08	-0.03%	0.25%

Housing Units	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	154,269	4.11	0.58%	281,800	3.99	0.56%	-0.02%
2007-2010	62,924	0.65	0.21%	150,992	2.06	0.68%	0.47%

Vacant Units	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	127,199	62.94	7.22%	213,428	53.78	6.34%	-0.88%
2007-2010	-22,485	-6.83	-2.33%	-17,915	-2.94	-0.99%	1.34%

Occupied Units	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	27,070	0.76	0.11%	68,373	1.03	0.15%	0.04%
2007-2010	85,409	2.39	0.79%	168,907	2.51	0.83%	0.04%

Table 19: Annualized Percent Change in the Non-Core less the Core

From 2000 to 2007, population centralized by a miniscule 0.01% as the core area was growing slightly faster than the non-core. During the recession, both the core area and non-core area saw a decline in population, but the non-core area declined slower than the core by 0.25%. Consistent with population, housing unit growth slightly centralized in the earlier time period as the core grew faster than the non-core by 0.02%. This trend reversed during the recession and housing unit growth decentralized as the non-core area accelerated in growth while the core area slowed. Vacant unit growth accelerated from 2000 to 2007, with the core area growing faster than the non-core by 0.88%, slightly centralizing. During the recession, both the core and non-core areas declined in vacant units, with the core area declining faster than the non-core. Occupied unit growth decentralized by .04% during both time periods, as the non-core area grew slightly faster than the core area.

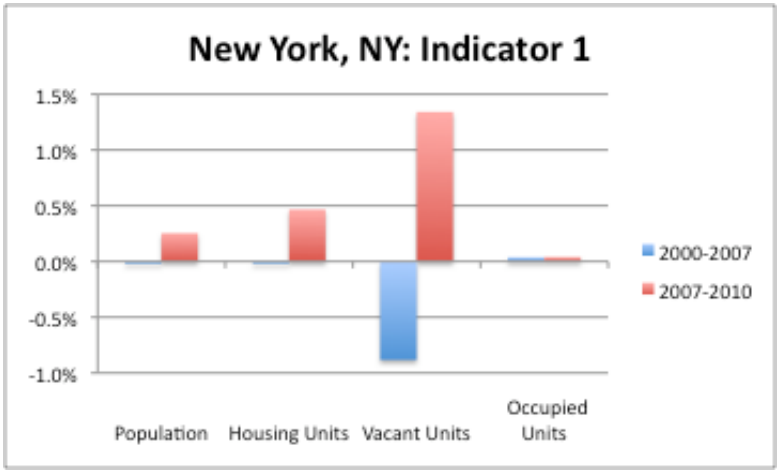


Figure 52: Annualized Percent Changes of the Non-Core less the Core

The New York MSA's core share of population and housing units slightly increased from 2000 to 2007 by 0.03% and 0.06% respectively. This trend reversed during the recession, and the core's share of both variables reduced by 0.39% and 0.23% respectively. While the core's share of vacant units moved in the same direction, the increase in share followed by decline was much more dramatic at 3.03% from 2000 to 2007 and -2.16% during the recession. Inconsistent with these trends, the core's share of occupied units slightly declined during both periods from 53.34% in 2000 to 53.2% in 2007 to 53.13% in 2010.

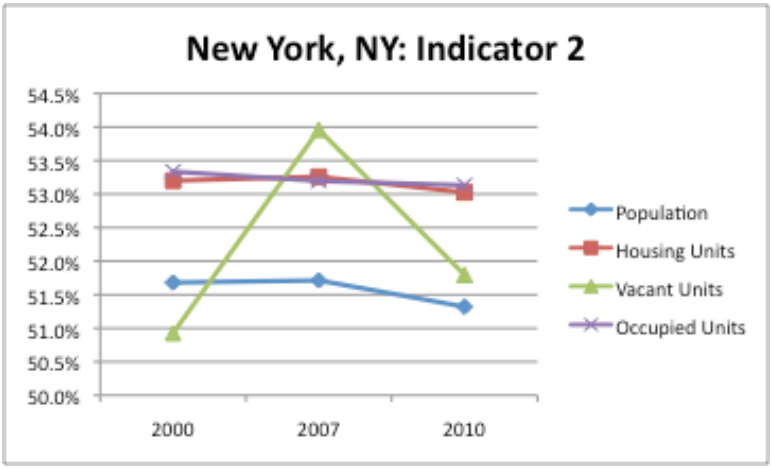


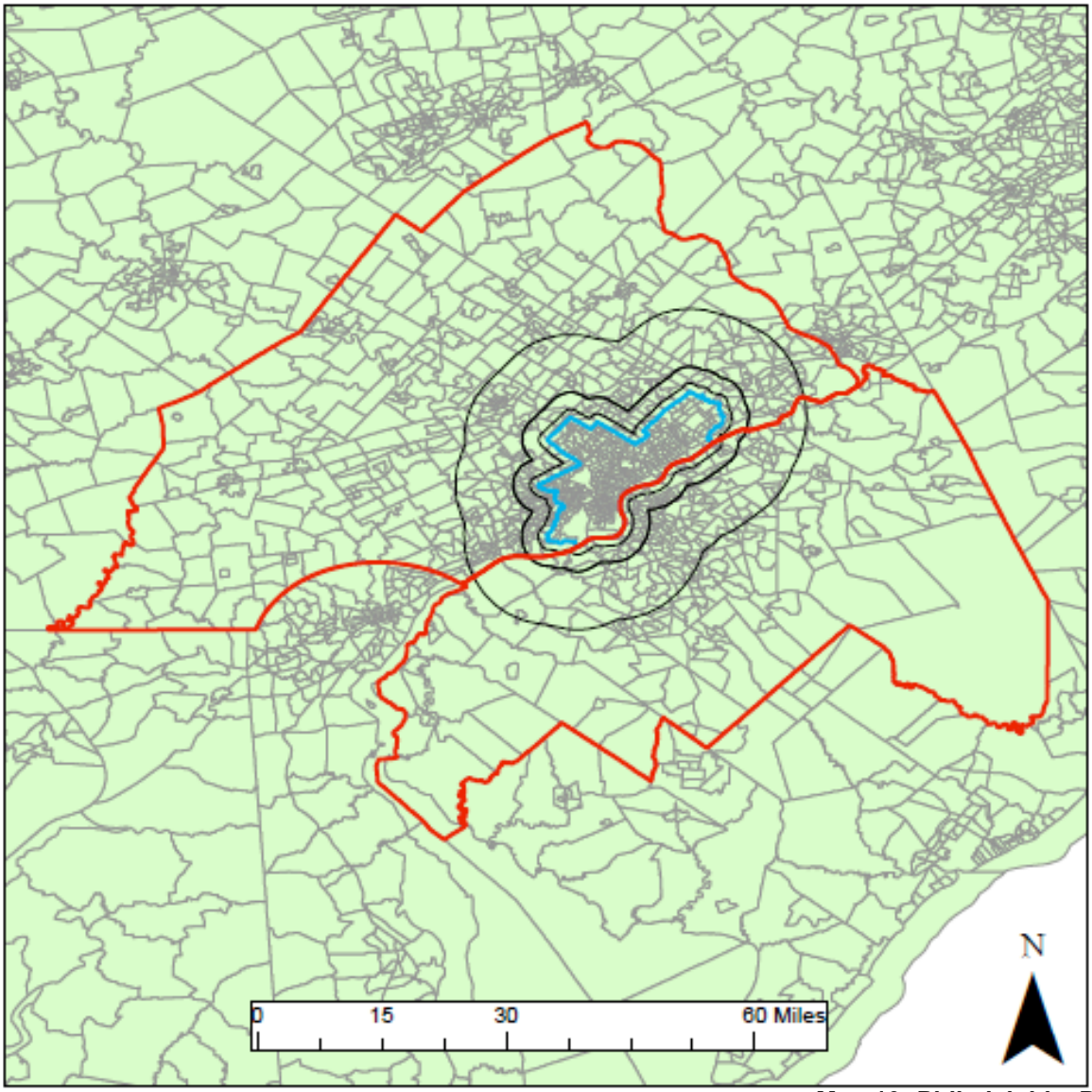
Figure 53: Core's Share of all Variables from 2000-2010

Summary

During the recession, population and vacant unit growth declined, with vacant units declining quite dramatically. Housing unit and occupied unit rates inclined slightly, mostly due to growth within the place – 1 mile boundary. All variables were centralizing leading up to the recession, and began to decentralize during the recession. The exception was the occupied units variable, which maintained a slight rate of decentralization in both periods. All other variables decentralized at a very slow rate however. The core's share of all variables declined during the recession, but this was most noticeable for the population and vacant units variables. Overall, the New York MSA decentralized during the recession, however this was at a slow rate and was more significant for population and housing units.

Philadelphia, PA

Map 10 shows the spatial zones of analysis for the Philadelphia, PA MSA:



Map 10: Philadelphia, PA

Table 20 shows the annualized percent change in each variable for the 5 spatial zones within the Philadelphia, PA MSA:

2000-2007	Population	Housing Units	Vacant Units	Occupied Units
PLACE	.12%	-.01%	4.06%	-.58%
PLACE - 1 MILE	-.38%	-.01%	5.80%	-.48%
1 - 3 MILE	-.02%	.24%	2.57%	.07%
3 - 10 MILE	.27%	.52%	5.26%	.29%
10 MILE - MSA	1.27%	1.39%	.16%	1.30%
Totals	.87%	2.12%	22.15%	.12%

2007-2010	Population	Housing Units	Vacant Units	Occupied Units
PLACE	-.04%	.20%	-4.12%	.82%
PLACE - 1 MILE	.47%	.23%	-3.48%	.56%
1 - 3 MILE	.05%	.05%	-.64%	.10%
3 - 10 MILE	.03%	.18%	.01%	.20%
10 MILE - MSA	.28%	.53%	1.75%	.47%
Totals	.79%	1.19%	-6.48%	2.14%

Table 20: Annualized Percent Change in all Variables from 2000-2007 & 2007-2010

Population

For the 2000 to 2007 period, the non-core areas experienced faster population growth than the core areas. The 10 mile - MSA boundary was the fastest by more than triple the rate of the other zones at 1.27%. The place – 1 mile and 1 – 3 mile zones experienced declining population rates, however these were slight at -0.38% and -0.02% respectively. During the recession, the non-core areas experienced a slowing of population growth rates, however they continued to be positive. Conversely, the 1 – 3 mile and place – 1 mile zone accelerated in growth from 2007 to 2010, however the 1 – 3 mile change was miniscule. The place – 1 mile zone, which previously had seen declining population, was the fastest growing zone during the recession at 0.47% per year. The place boundary was the only area to see a decline in population during the recession at a slow rate of -0.04% per year.

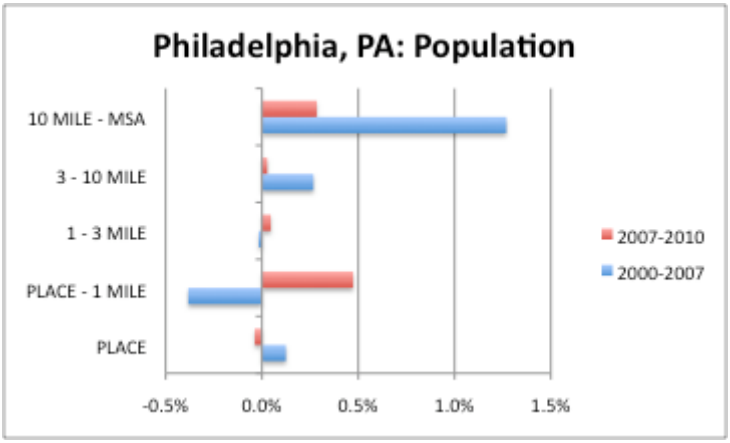


Figure 54: Annualized Percent Change in Population

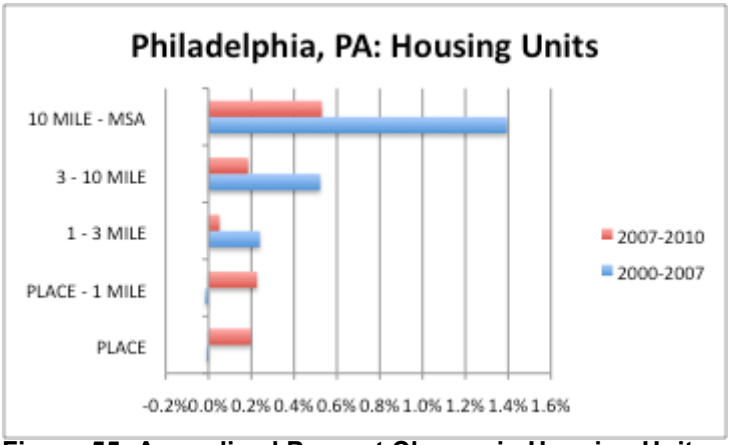


Figure 55: Annualized Percent Change in Housing Units

Housing Units

From 2000 to 2007, all growth in housing units took place in the non-core areas as well as the 1 – 3 mile zone. The 10 mile – MSA zone had the greatest positive change in housing units with a 1.39% annual rate. All other zones were at or below 0.5%. The place boundary and place – 1 mile area experienced negative housing unit change for this time period, however these were very miniscule at -0.01%. Conversely, these two core areas accelerated their rate of housing unit change during the recession while the other three zones slowed in growth. The 10 mile - MSA boundary remained the fastest growing in housing units at 0.53% annually.

Vacant Units

Philadelphia experienced positive growth rates for vacant units in all spatial zones from 2000 to 2007. Both the core-areas and the 3 – 10 mile area saw relatively fast growth of vacancy with the place – 1 mile being the fastest at 5.8% per year. The 10 mile - MSA zone experienced the slowest growth of vacant units at 0.16% per year. During the recession, the 10 mile - MSA boundary was the only area to see acceleration in the growth of vacant units to 1.75%. The core areas had the most significant decline since all three zones reversed their trends and experienced negative rates of vacant units. This was most dramatic for the place boundary and place – 1 mile area, which declined at -4.12% and -3.48% respectively.

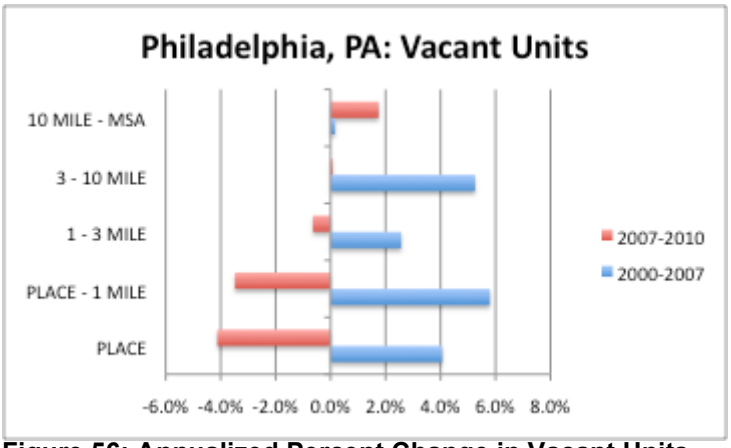


Figure 56: Annualized Percent Change in Vacant Units

Occupied Units

From 2000 to 2007, the non-core areas of Philadelphia experienced positive growth rates of occupied units while the core areas largely experienced a declining rate of occupied units. The 1 – 3 mile area was the exception, but the positive rate was very slight at 0.07%. The 10 mile - MSA boundary experienced the fastest annual rate of occupied units at 1.3% per year. Throughout the recession, the core areas accelerated in the growth of occupied units while the non-core areas slowed. For the core areas, this trend reversal was most significant in the place – 1 mile and 1 – 3 mile zones since they had previously experienced negative growth. However, the growth rates were not particularly rapid at 0.56% and 0.1% per year respectively.

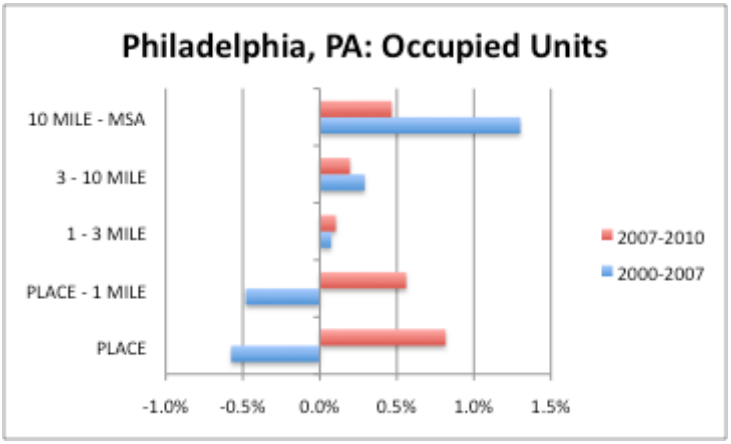


Figure 57: Annualized Percent Change in Occupied Units

Centralization Indicators

Table 21 shows the annualized percent change for each variable within the core and non-core variables and the results of indicator 1:

Population	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	7,095	0.33	0.05%	182,209	3.57	0.50%	0.46%
2007-2010	4,297	0.20	0.07%	42,608	0.81	0.27%	0.20%

Housing Units	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	2,570	0.28	0.04%	83,993	4.10	0.58%	0.54%
2007-2010	11,136	0.51	0.17%	43,503	2.04	0.68%	0.51%

Vacant Units	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	27,526	31.42	3.98%	43,037	32.30	4.08%	0.10%
2007-2010	-26,230	-22.78	-8.26%	-22,090	-12.53	-4.36%	3.89%

Occupied Units	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	-24,956	-2.98	-0.43%	40,957	2.14	0.30%	0.73%
2007-2010	37,367	4.60	1.51%	65,592	3.35	1.11%	-0.40%

Table 21: Annualized Percent Change of the Non-Core less the Core

Population in both periods decentralized as the non-core area grew faster than the core. However, this slowed during the recession as the core area slightly accelerated in population growth and the non-core area declined. Consistent with this trend, housing unit growth decentralized in both periods at a somewhat consistent rate of 0.54% from 2000 to 2007 and 0.51% from 2007 to 2010. Decentralization remained stable during the recession because both the core and non-core area accelerated in housing unit growth at a similar pace. Vacant unit growth accelerated in both the core and non-core from 2000 to 2007, however the non-core grew slightly faster by .1%. Reversing this trend, both areas saw a decline in vacant units during the recession, with the core area losing vacant units faster than the core by 3.89%. Occupied units decentralized from 2000 to 2007 as the core area saw a negative rate and the non-core area saw a slight increase in units. Both areas accelerated

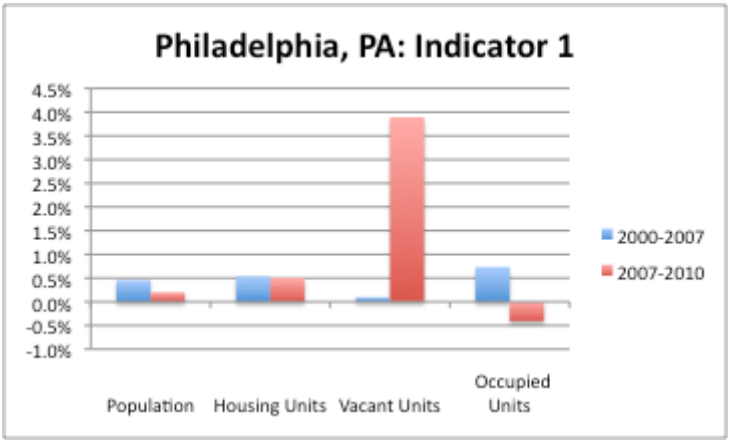


Figure 58: Annualized Percent Change of the Non-Core less the Core

in occupied unit growth during the recession, however occupied units began to centralize since the core area accelerated faster by 0.4%.

The Philadelphia MSA's core share of population and housing units declined during both time periods, but this decline slowed for both variables during the recession. The core's share of vacant units also experienced a decline in both periods, however this largely accelerated during the recession from a 65.3% core share in 2007 to a 57.7% core share in 2010. The core's share of occupied units also declined from 2000 to 2007 by 2.19%, however the core slightly regained a share of occupied units by .5% in 2010.

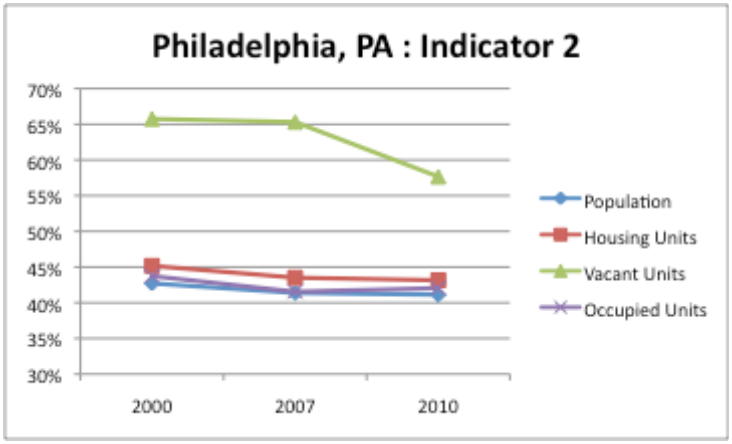


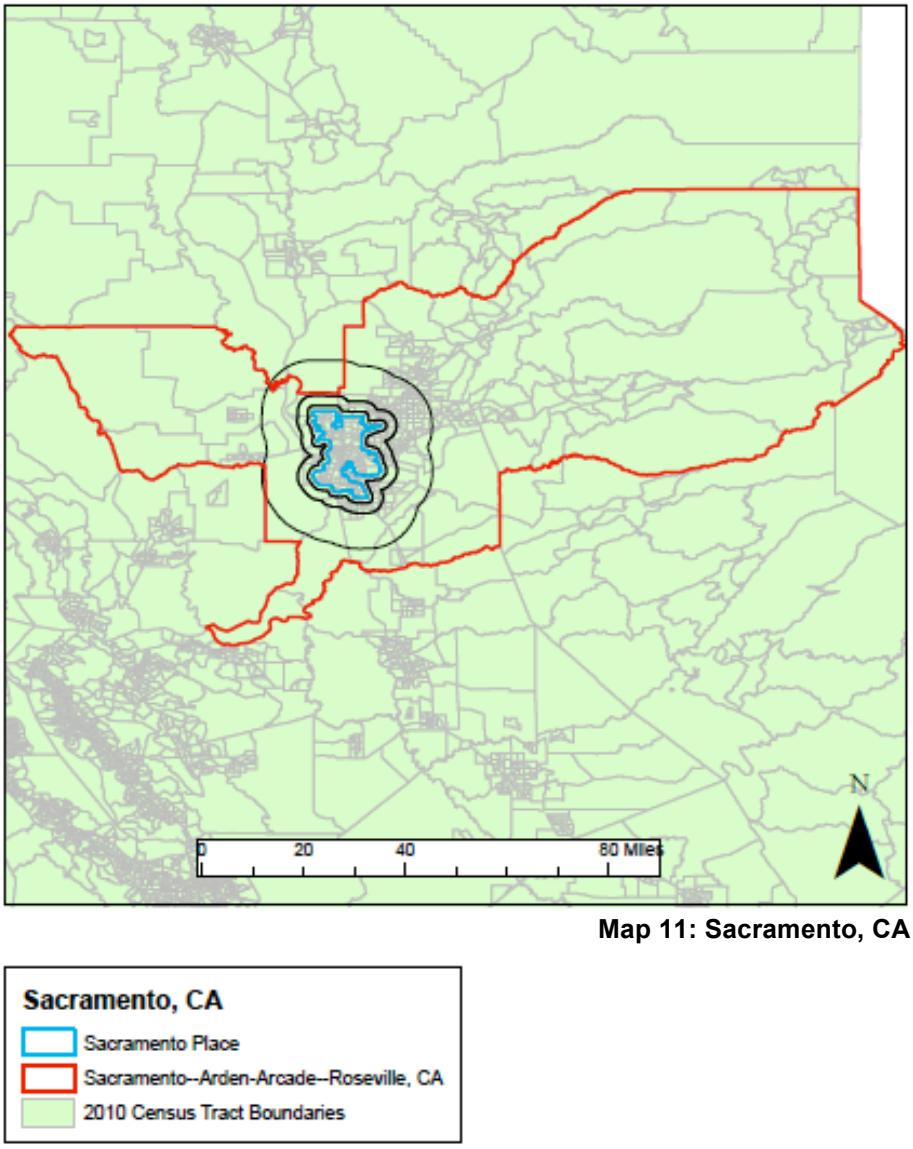
Figure 59: Core's Share of all Variables from 2000-2010

Summary

During the recession, the MSA slowed in housing unit and population growth and stopped growing vacant units altogether. Inconsistent with these trends, occupied unit growth accelerated after 2007. Most of this growth occurred in the non-core leading up to 2007, but some core areas began to pick up speed during the recession, making it more balanced. During the recession, both population and housing units decentralized, but this was slower than the previous period. Vacant units in the core were declining almost double the rate of the non-core and occupied units actually began to centralize. This centralization of occupied units allowed the core's share to increase from 2007 to 2010, while the core's share of all other variables declined slightly. Overall, the Philadelphia core picked up speed during the recession, but was not fast enough to reverse decentralization trends. Occupied units most likely centralized because the decline in vacant units in the core was so rapid.

Sacramento, CA

Map 11 shows the spatial zones of analysis for the Sacramento, CA MSA:



Map 11: Sacramento, CA

Table 22 shows the annualized percent change in each variable for the 5 spatial zones within the Sacramento, CA MSA:

2000-2007	Population	Housing Units	Vacant Units	Occupied Units
PLACE	0.57%	1.20%	7.95%	0.70%
PLACE - 1 MILE	1.97%	2.61%	12.49%	1.96%
1 - 3 MILE	2.95%	2.95%	13.39%	2.43%
3 - 10 MILE	2.11%	2.23%	11.52%	1.78%
10 MILE - MSA	2.76%	2.96%	4.66%	2.72%
Totals	10.36%	11.96%	50.01%	9.58%

2007-2010	Population	Housing Units	Vacant Units	Occupied Units
PLACE	0.75%	0.47%	0.07%	0.51%
PLACE - 1 MILE	0.02%	-0.45%	-0.31%	-0.46%
1 - 3 MILE	-0.03%	-0.02%	-0.01%	-0.02%
3 - 10 MILE	0.44%	0.26%	-0.26%	0.29%
10 MILE - MSA	0.70%	1.03%	1.01%	1.03%
Totals	1.87%	1.29%	0.51%	1.36%

Table 22: Annualized Percent Change in all Variables from 2000-2007 & 2007-2010

Population

From 2000 to 2007, all spatial zones throughout the Sacramento MSA experienced positive growth of population. The 1 – 3 mile area experienced the fastest rate at 2.95% annually, but the non-core area rates followed close behind. The place boundary experienced the slowest change in population at 0.57% annually. During the recession, all rates declined dramatically except for the place boundary. Most significant was the change in the 1 – 3 mile area, which declined to -0.03% from 2.95%. The place boundary increased slightly from 0.57% to 0.75% per year, going from the slowest growth area in the previous period to the fastest growth area during the recession.

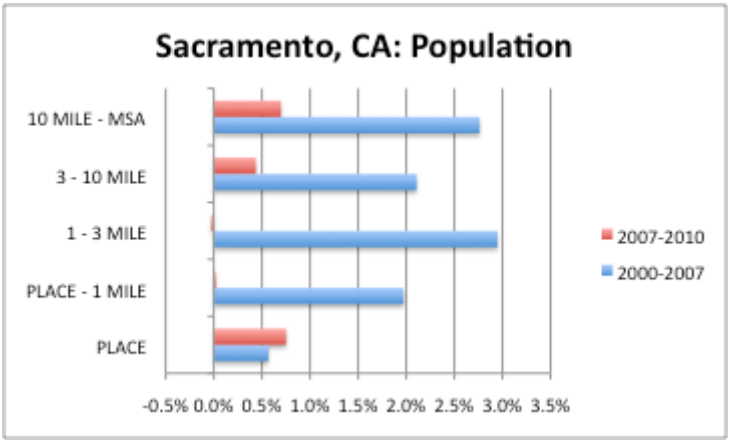


Figure 60: Annualized Percent Change in Population

Housing Units

Similar to population trends, all areas experienced positive housing unit growth from 2000 to 2007. These rates were slightly faster than the population rates, with the 10 mile -

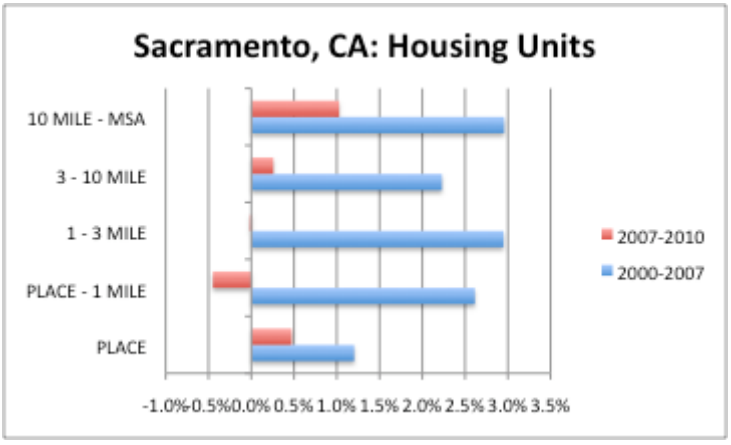


Figure 61: Annualized Percent Change in Housing Units

MSA and the 1 – 3 mile areas taking the lead at an annual rate of 2.96% and 2.95% respectively. Again, the place boundary experienced the slowest growth of housing units at 1.2% per year. During the recession, all rates dramatically declined. Only the place – 1 mile and 1 – 3 mile zones saw negative housing unit growth rates but these were low at -0.45% and -0.02% per year. The 10 mile - MSA boundary remained the fastest growing for housing units during the latter time period at 1.03%

Vacant Units

Vacant unit rates grew rapidly leading up to the recession with the 3 – 10 mile, 1 – 3 mile, and place – 1 mile zones experiencing rates greater than 10% per year. The 1 – 3 mile had the fastest growth of vacant units at 13.39% while the 10 mile - MSA boundary had the slowest at 4.66%. All rates declined significantly from 2007 to 2010, with most zones dropping to almost zero percent growth or below. Both the place – 1 mile and 3 – 10 mile areas experienced a decline in vacant units at -0.31% and -0.26% per year. The 10 mile - MSA boundary, which previously had been the slowest growing area for vacant units, became the fastest growing area at 1.01% per year.

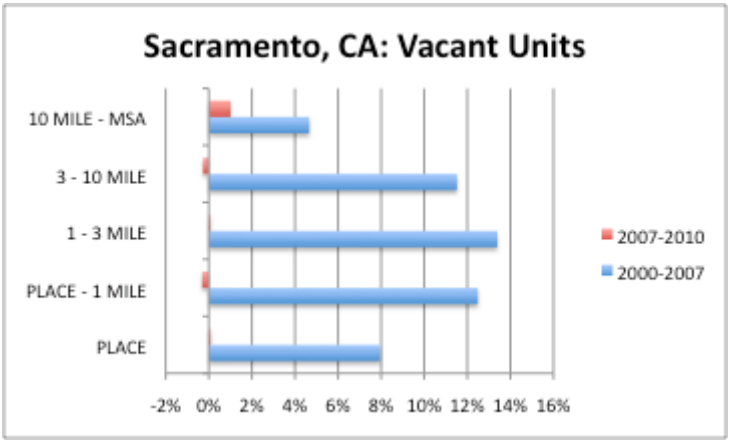


Figure 62: Annualized Percent Change in Vacant Units

Occupied Units

Occupied unit trends for both time periods were very similar to housing unit trends. All areas experienced positive change in occupied units from 2000 to 2007. The 10 mile - MSA boundary had the fastest rate at 2.72% and the place boundary experienced the slowest rate at 0.70% per year. All rates declined somewhat dramatically during the recession, however the place – 1 mile and 3 – 10 mile zones were the only areas to see a negative occupied unit rate at -0.26% and -0.02% per year. The 10 mile - MSA zone remained the fastest increasing area for occupied units, however this was half of the speed of the previous period at 1.03%.

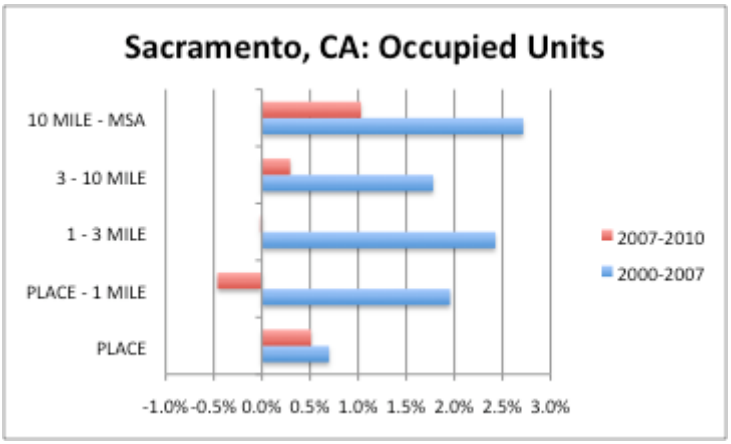


Figure 63: Annualized Percent Change in Occupied Units

Centralization Indicators

Table 23 shows the annualized percent change for each variable within the core and non-core variables and the results of indicator 1:

Population	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	94,205	11.54	1.57%	279,722	15.57	2.09%	0.52%
2007-2010	22,846	2.51	0.83%	72,549	3.49	1.15%	0.32%

Housing Units	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	47,577	14.84	2.00%	127,886	17.89	2.38%	0.38%
2007-2010	3,516	0.39	0.13%	28,926	3.43	1.13%	1.00%

Vacant Units	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	14,992	95.95	10.09%	31,822	64.05	7.33%	-2.76%
2007-2010	-66	-0.22	-0.07%	2,621	3.22	1.06%	1.13%

Occupied Units	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	32,585	10.68	1.46%	96,064	14.44	1.95%	0.49%
2007-2010	3,582	1.06	0.35%	26,305	3.46	1.14%	0.79%

Table 23: Annualized Percent Change of the Non-Core less the Core

Population decentralized in both periods of analysis for the Sacramento MSA, since the non-core area grew faster than the core area. Population growth slowed during the recession for both the core and non-core. Consistent with this trend, housing unit growth decentralized in both time periods. However, during the recession, decentralization of housing units accelerated since the core area slowed more so than the non-core area. While both areas were rapidly increasing in vacant units from 2000 to 2007, growth was centralized as the core area grew faster than the non-core by 2.76%. This trend reversed during the recession as the core area began to decline in vacant units and the non-core continued to experience growth, though it was at a much slower rate. Occupied unit growth also decentralized during both time periods with the non-core area growing faster than the core. The core area slowed in occupied units growth during the recession more so than the non-core and therefore decentralization accelerated.

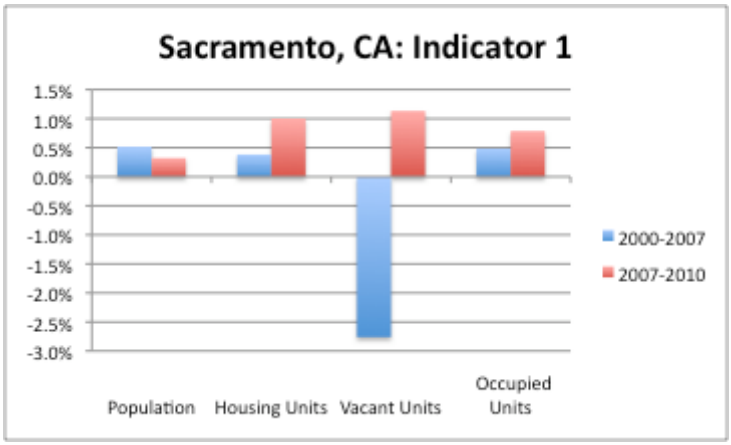


Figure 64: Annualized Percent Change of the Non-Core less the Core

The core's share of population, housing units, and occupied units declined from 2000 to 2007 and then again from 2007 to 2010. This decline was most dramatic for occupied units, which declined a total of 2.53% from 2000 to 2010. The core's share of vacant units increased from 2000 to 2007 from 31.4% of the vacant units in 2000 to 37.6% by 2007. This share declined during the recession but only by 1.25% leaving the core's share of vacant units in 2010 at 36.3%.

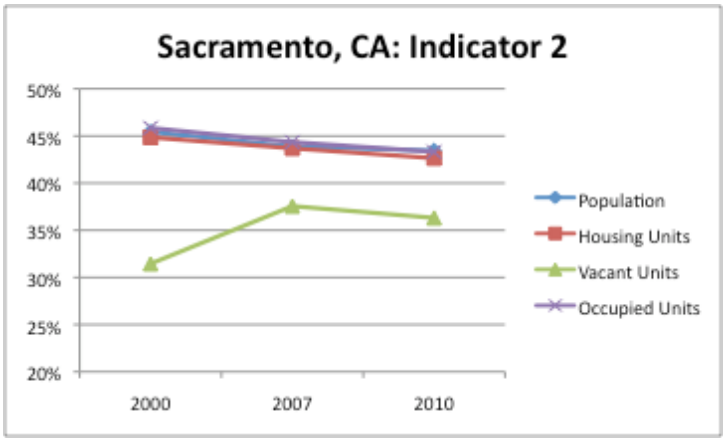


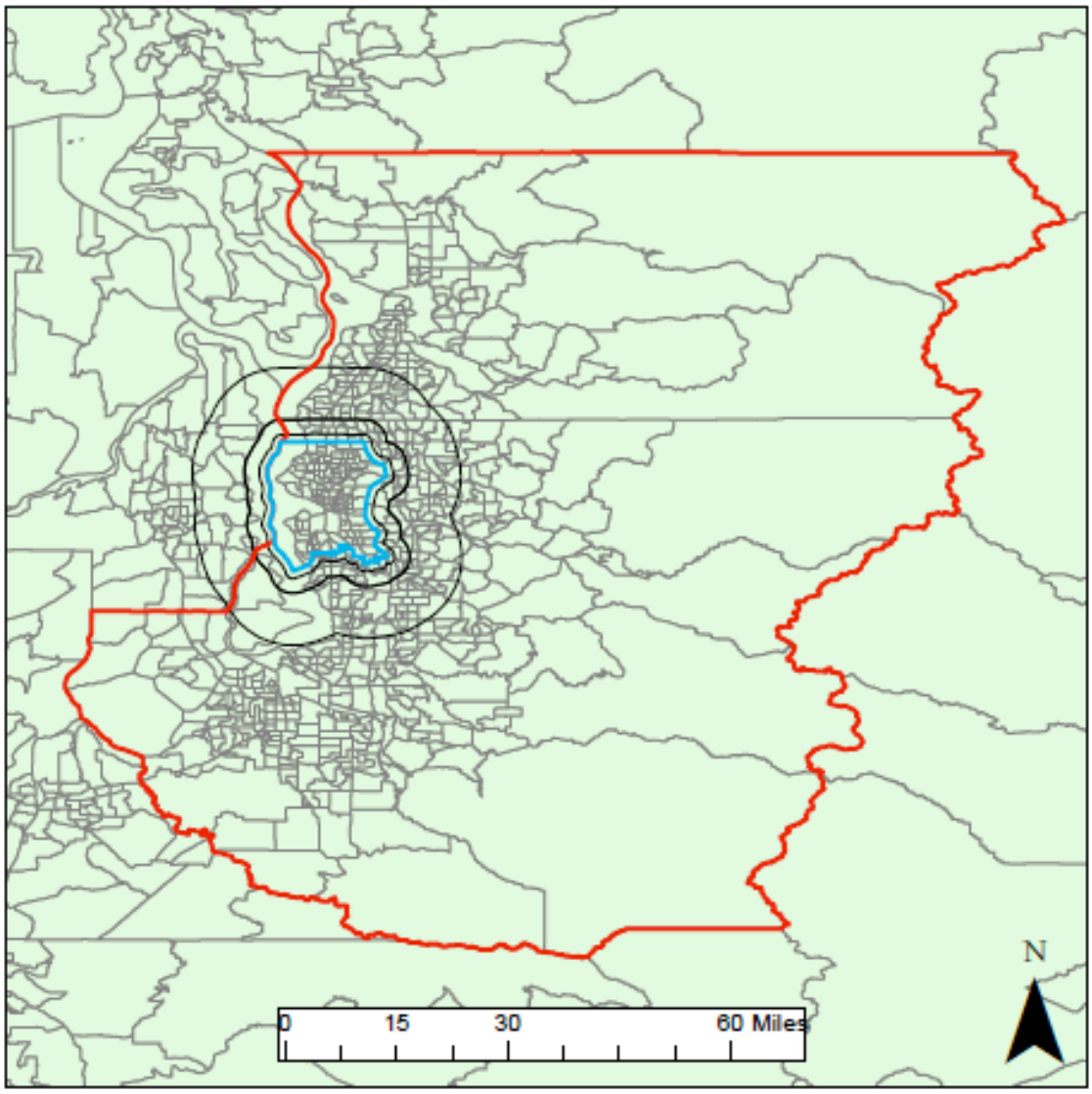
Figure 65: Core's Share of all Variables from 2000-2010

Summary

During the recession, all growth rates slowed quite drastically throughout the MSA. The core areas slowed more dramatically than the non-core, except for the place boundary, which maintained levels of growth consistent with the non-core. Decentralization accelerated for housing units and occupied units, but slowed for population slightly. Vacant units declined in the core area during the recession, but continued to grow in the non-core area. The core's share of all variables declined during the recession, but this was rather slight. Overall, it seems that the outer core areas (place – 1 mile and 1 – 3 mile boundaries) were more affected by the recession in terms of slowed growth while the place boundary was more resilient. Decentralization largely continued because of the core areas slow growth areas despite the place boundaries continued growth.

Seattle, WA

Map 12 shows the spatial zones of analysis for the Seattle, WA MSA:



Map 12: Seattle, WA

Table 24 shows the annualized percent change in each variable for the 5 spatial zones within the Seattle, WA MSA:

2000-2007	Population	Housing Units	Vacant Units	Occupied Units
PLACE	0.76%	1.36%	7.80%	0.99%
PLACE - 1 MILE	-0.05%	0.44%	7.64%	0.07%
1 - 3 MILE	0.23%	0.65%	6.40%	0.37%
3 - 10 MILE	1.19%	1.64%	5.96%	1.41%
10 MILE - MSA	1.52%	1.96%	5.38%	1.76%
Totals	3.64%	6.06%	33.19%	4.60%

2007-2010	Population	Housing Units	Vacant Units	Occupied Units
PLACE	0.35%	0.53%	2.99%	0.33%
PLACE - 1 MILE	0.28%	0.10%	-0.15%	0.12%
1 - 3 MILE	0.63%	0.66%	4.01%	0.43%
3 - 10 MILE	0.62%	0.48%	2.88%	0.31%
10 MILE - MSA	0.62%	0.65%	1.89%	0.55%
Totals	2.50%	2.41%	11.61%	1.75%

Table 24: Annualized Percent Change of all Variables from 2000-2007 & 2007-2010

Population

From 2000 to 2007, the non-core area experienced faster growth rates than the core-area with the 10 mile - MSA boundary having the fastest growth at 1.52%. Within the core area, the place boundary experienced the highest change in population, however this was relatively slow at 0.76% per year. The place – 1 mile boundary was the only area to show a declining population rate at -0.05%. During the recession the place – 1 mile and 1 – 3 mile areas accelerated in population change, with the place – 1 mile reversing its negative trend to a positive 0.28%. The non-core areas and the place boundary all slowed in population growth for the latter time period, however the non-core areas remained on par with the 1 – 3 mile boundary at 0.62%.

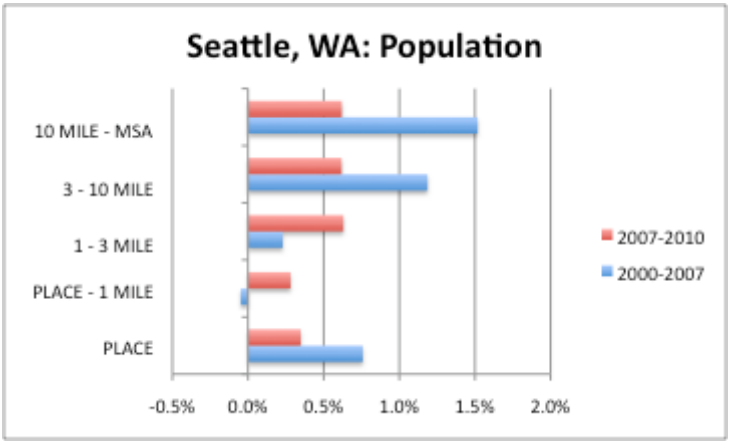


Figure 66: Annualized Percent Change in Population

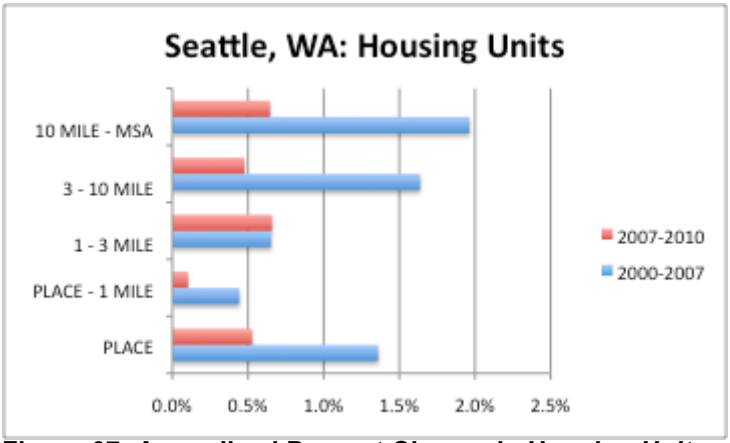


Figure 67: Annualized Percent Change in Housing Units

Housing Units

All spatial zones experienced positive housing unit growth from 2000 to 2007, however this remained below 2% annually as seen in Figure 67. Similar to population trends, the non-core areas outpaced the core areas with the 10 mile - MSA boundary experiencing the fastest growth in housing units at an annual rate of 1.96%. Unlike population, the place – 1 mile boundary did not experience a decline in units, but was the slowest growing area at 0.44% per year. During the recession, all housing unit growth rates declined significantly except for the 1 - 3 mile area. While this zone only increased by 0.01%, it became the fastest growing area in housing units during the recession, followed closely behind by the 10 mile - MSA boundary. The place – 1 mile zone continued to experience the slowest growth in housing units at 0.1%.

Vacant Units

Vacant units grew rapidly from 2000 to 2007, with the core area experiencing faster rates of growth than the non-core areas. The place boundary experienced the fastest rate at 7.8% with each progressive zone slowing slightly in vacant unit increases. The 10 mile – MSA zone was the slowest at 5.38%. During the recession all rates declined, however the place – 1 mile boundary was the only area to experience a negative rate at -0.15% per year. The 1 – 3 mile boundary experienced the fastest vacant unit growth in this time period at 4.01%.

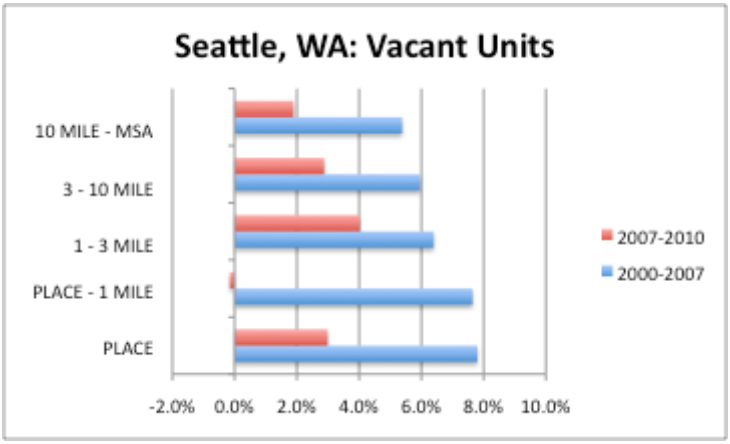


Figure 68: Annualized Percent Change in Vacant Units

Occupied Units

The non-core area experienced the fastest occupied unit rates from 2000 to 2007, however all rates were below 2% per year. The 10 mile - MSA boundary was the fastest at 1.76% and the place – 1 mile boundary was the slowest at a meager 0.07% gain per year. These rates were consistent with housing unit and population trends during the earlier time period. From 2007 to 2010, all rates declined except for the place – 1 mile and 1 – 3 mile zones. These zones only increased slightly and remained below 0.5% per year. The 10 mile - MSA boundary remained the fastest growing in the latter period at a 0.55% annual rate while the place – 1 mile zone remained the slowest at 0.12% per year.

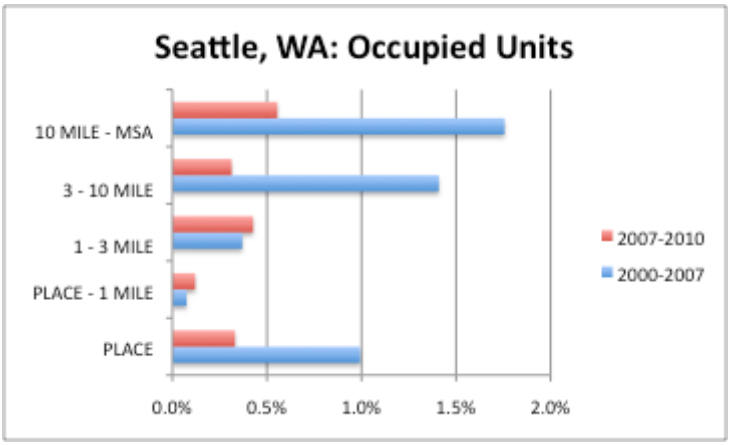


Figure 69: Annualized Change in Occupied Units

Centralization Indicators

Table 25 shows the annualized percent change for each variable within the core and non-core variables and the results of indicator 1:

Population	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	33,655	4.08	0.57%	267,143	8.62	1.19%	0.62%
2007-2010	25,022	2.91	0.96%	135,611	4.03	1.33%	0.36%

Housing Units	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	31,572	8.31	1.15%	154,550	12.09	1.64%	0.50%
2007-2010	15,530	1.81	0.60%	58,208	4.06	1.34%	0.74%

Vacant Units	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	10,795	66.01	7.51%	31,165	51.50	6.11%	-1.40%
2007-2010	6,299	23.20	7.20%	16,998	18.54	5.83%	-1.37%

Occupied Units	Core	Change	Annualized	Non-Core	Change	Annualized	Indicator 1
2000-2007	20,777	5.71	0.80%	123,385	10.13	1.39%	0.59%
2007-2010	9,230	2.40	0.79%	41,210	3.07	1.01%	0.22%

Table 25: Annualized Percent Change of the Non-Core less the Core

For the Seattle MSA, population decentralized in both time periods of analysis, with the non-core area growing faster than the core area. Decentralization slowed, however, during the recession. Similarly, housing unit growth decentralized from 2000 to 2007 as well as 2007 to 2010 due to the non-core area growing faster in housing units than the core area. Unlike population however, decentralization of housing units accelerated during the recession. While both areas were growing in vacant units from 2000 to 2007, vacant unit growth slightly centralized as the core area was growing faster than the non-core. Unlike other cities analyzed, this trend remained consistent during the recession with only slight drops in the rate of increasing vacant units. Occupied unit growth decentralized during both time periods of analysis as the non-core area grew faster than the core area. This slowed slightly during the recession since the growth of occupied units in the core remained consistent while the growth slowed for the non-core.

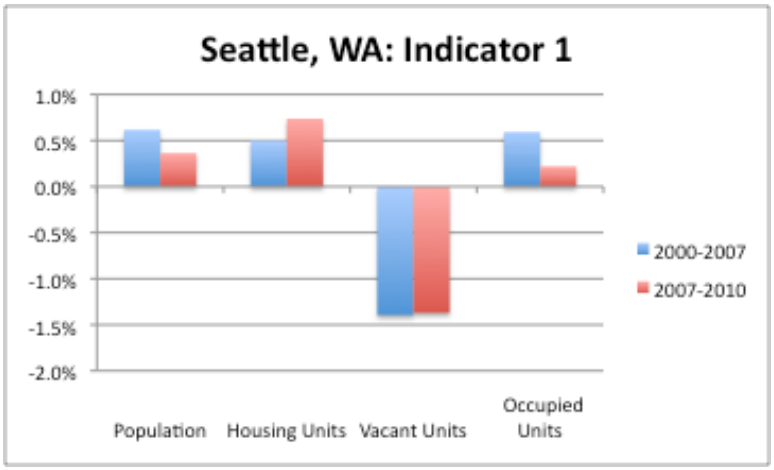


Figure 70: Annualized Percent Change of the Non-Core less the Core

The Seattle MSA's core share of population, housing units, and occupied units all declined at consistent rates from 2000 to 2007 and continued to decline throughout the recession as seen in Figure 71. From 2007 to 2010, this decline slowed for all variables. Inconsistent with this trend, the core's share of vacant units increased from 2000 to 2007 by 2.59%. This incline continued through the recession but slowed to a 1.16% change. This was unlike most other cities analyzed, which experienced a decline in the core's share of vacant units during the recession.

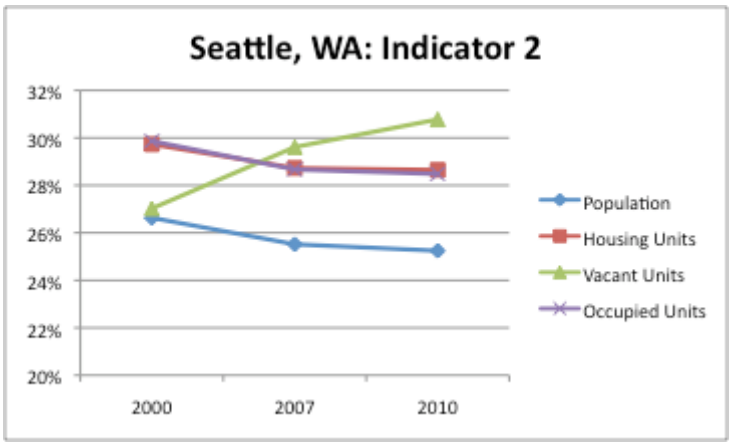


Figure 71: Core's Share of all Variables from 2000-2010

Summary

During the recession, most zones within the MSA experienced slowed growth for all variables. Population in the core, however, did accelerate in growth during the recession and the decline in occupied units was very slight. Decentralization continued for all variables except for vacant unit change, however decentralization only accelerated for the housing unit variable. Vacant unit growth was growing faster in the core than the non-core for both periods, however this slowed slightly during the recession. The core's share of population, housing units, and occupied units continued to decline during the recession, but the rate at which it declined was slower from 2007 to 2010. Overall, it seems that decentralization stabilized during the recession. However, the growth of vacant units within the core continued to be very high, forcing the core to assume a greater share of vacancy.

Conclusion

This study analyzed development, housing, and population trends for 12 U.S. cities to understand whether centralization or decentralization occurred during the Great Recession. Indicators were compared against the period leading up to the recession (2000 to 2007), in order to analyze the effects of the recession on development trends.

Overall, decentralization of population, housing units, and occupied units were widespread leading up to the recession in most cities analyzed. During the recession all cities decentralized. For New York and Birmingham, there was an overall trend reversal from centralization to decentralization. Five cities continued to decentralize as before, but this rate slowed from the previous period. These cities included Baltimore, Denver, Minneapolis, Philadelphia, and Seattle. Lastly, the five remaining cities continued to decentralize but accelerated in decentralization through the recession. This included Dallas, Kansas City, Los Angeles, Miami, and Sacramento.

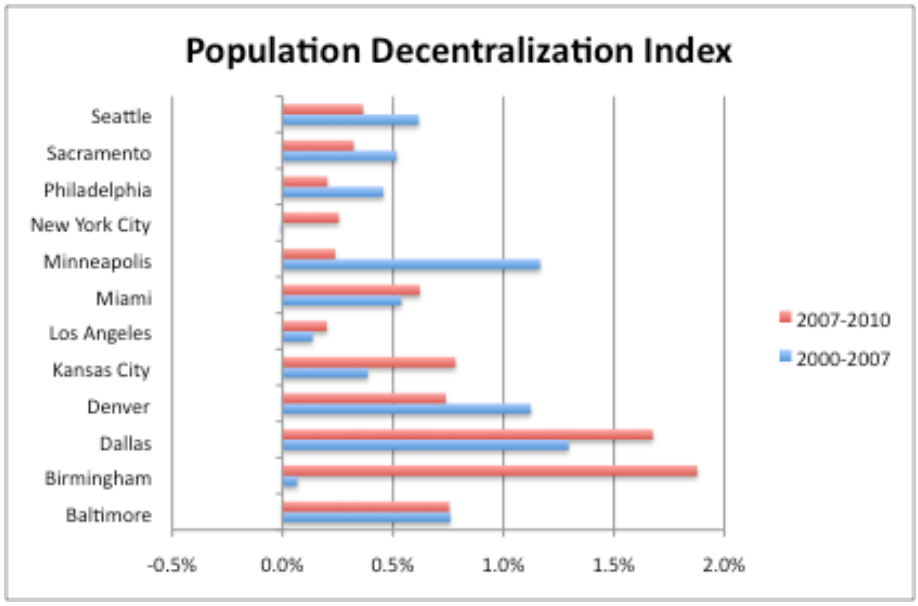


Figure 72: Population Decentralization Index

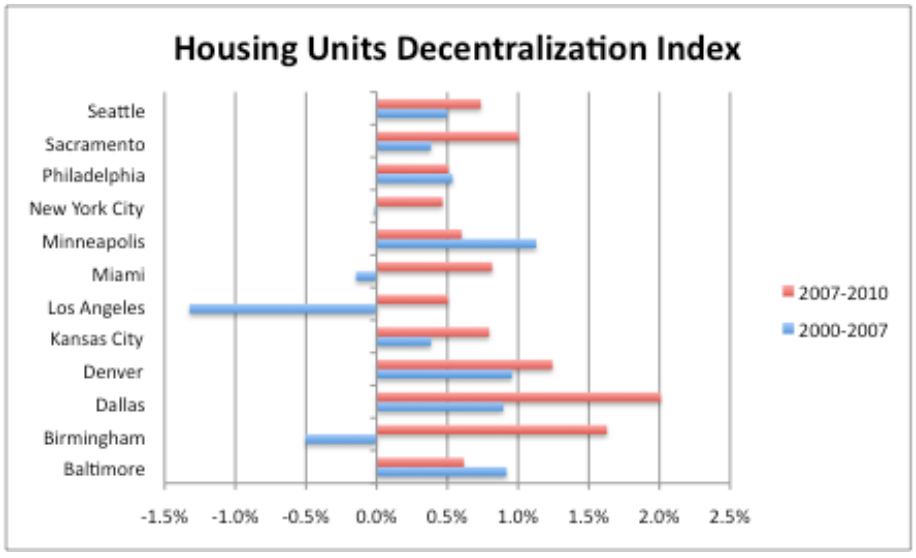


Figure 73: Housing Units Decentralization Index

Figure 72 compares the population results of indicator 1 across the twelve cities for both time periods. Except for New York City, which experienced slight centralization of population (by .01%), all cities experienced decentralization of population in both time periods. Decentralization of population leading up to the recession was most apparent in Dallas, Denver, Baltimore and Minneapolis. While Baltimore's population

continued to decentralize at the same rate through the recession, New York City, Miami, Kansas City, Dallas, and Birmingham began to experience an acceleration of decentralizing population. On the other hand, Seattle, Sacramento, Philadelphia, Minneapolis, and Denver 's rate of decentralization for population slowed during the recession.

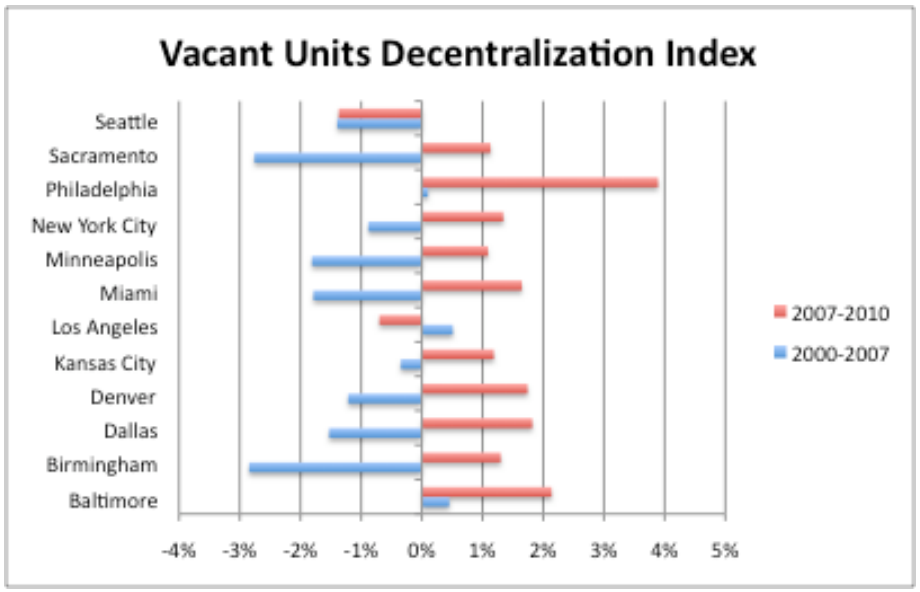


Figure 74: Vacant Units Decentralization Index

Figure 73 shows the centralization or decentralization of housing units from 2000 to 2007 and 2007 to 2010. Unlike population, four cities experienced housing unit centralization from 2000 to 2007 including New York City (though very slight), Miami, Los Angeles, and Birmingham. All of these cities reversed during the recession and housing unit growth began to decentralize. During the recession, Dallas, Denver, and Birmingham experienced the most extreme decentralization of housing units. Philadelphia, Minneapolis, and Baltimore were the only cities to experience a slowing of decentralization during the recession.

Vacant unit decentralization in all twelve cities for both time periods is compared in Figure 74. Unlike the other variables, vacant units were largely centralizing in cities from 2000 to 2007. Only Philadelphia, Los Angeles, and Baltimore experienced a decentralization of vacant units in this time period. During the recession, all previously centralizing cities, except for Seattle, began to decentralize. Los Angeles was the only city to reverse in the other direction, decentralizing leading up to the recession, and slightly centralizing during the recession. Philadelphia saw the greatest decentralization of vacant

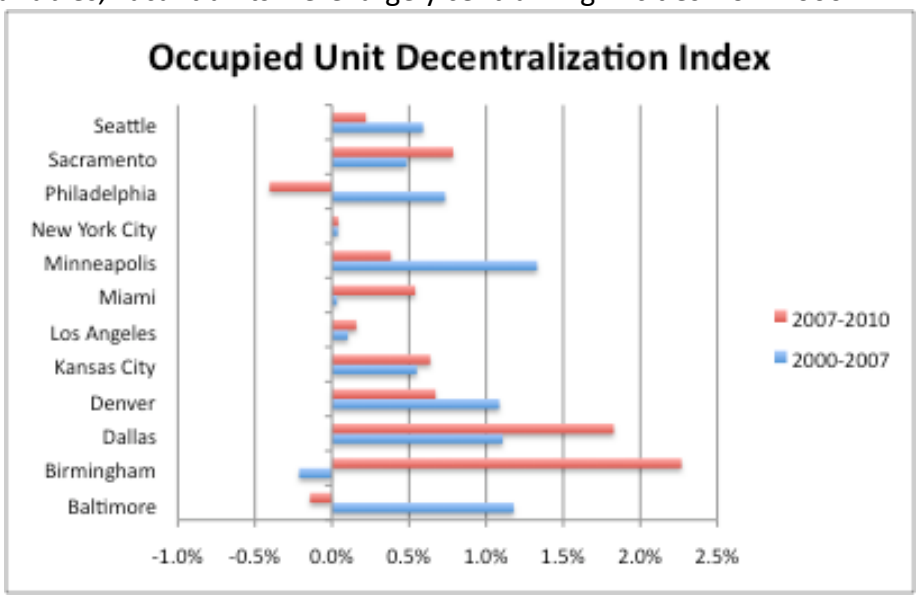


Figure 75: Occupied Unit Decentralization Index

units during the recession, followed by Baltimore, Dallas, and Denver.

Figure 75 compares the rates of occupied unit decentralization and centralization for all twelve cities across both time periods. Of all cities, Birmingham was the only city to experience centralization of occupied units from 2000 to 2007. Conversely, Minneapolis had the fastest rate of decentralization in the earlier time period, followed by Baltimore, Dallas, and Denver. Many cities experienced a slowdown in the rate of decentralization during the recession including Seattle, Philadelphia, Minneapolis, Denver, and Baltimore. Most notable, Philadelphia and Baltimore began to see centralizing occupied units during the recession. On the other hand, Sacramento, Miami, Los Angeles, Kansas City, Dallas, and Birmingham all experienced an acceleration of decentralization for occupied units during the recession. This was most dramatic for Birmingham, which went from the only city experiencing centralizing occupied units in 2000 to 2007 to the fastest decentralizing city during the recession.

Table 26 shows which variables experienced decentralization during both time periods of analysis. An empty box indicates centralization.

	Sea-ttle	Sacra-mento	Philad-elphia	NYC	Minnea-polis	Miami	LA	Kansas City	Denver	Dallas	Birm-ingham	Balti-more
HU 07	X	X	X		X		X	X	X	X	X	X
POP 07	X	X	X		X	X		X	X	X		X
VAC 07			X				X					X
OCC 07	X	X	X	X	X	X	X	X	X	X		X
HU 10	X	X	X	X	X	X	X	X	X	X	X	X
POP 10	X	X	X	X	X	X	X	X	X	X	X	X
VAC 10		X	X	X	X	X		X	X	X	X	X
OCC 10	X	X		X	X	X	X	X	X	X	X	

Table 26: Cities that experienced decentralization by variable

When comparing all twelve cities by the four variables of analysis, it is clear that more cities experienced decentralization of variables than centralization. Of particular note, no city experienced centralization of population or housing units during the recession. Furthermore, only two cities experienced centralization of occupied units. Vacant unit change was the only variable to clearly see the effects of the recession, since most cities were experiencing centralization of vacant units up until 2007 and then began to experience decentralization of vacant units. Overall, more cities began to see the decentralization of variables accelerate during the recession than slow. While continued research on more Metropolitan Statistical Areas throughout the nation should be conducted to further supplement this research with a more comprehensive understanding of development trends, the findings go against many academics and commentators who point to the recession as bringing about a paradigm shift to high-density centralized urban living.

VI. Bibliography

Anderson, W. P. (February 01, 1996). Urban Form, Energy and the Environment: A Review of Issues, Evidence and Policy. Urban Studies, 33, 1, 7-36.

Bragado, N., Corbett, J. (1995). Building livable communities: a policymaker's guide to infill development. Sacramento, CA: Center for Livable Communities.

Builder Magazine. (2010). The Builder Concept Home 2010: A Home for the New Economy. Retrieved from http://www.builderconcepthome2010.com/index-02.php

Bracha, A., & Jamison, J. (2011, October). Shifting Confidence in Home Ownership: The Great Recession (Federal Reserve Bank of Boston, Ed.).

Brown University. (2011). Us 2010: Discover America in a new century. Retrieved from http://www.s4.brown.edu/us2010/

Burchell, R. W., & Mukherji, S. (January 01, 2003). Conventional development versus managed growth: the costs of sprawl. American Journal of Public Health, 93, 9, 1534-40

Center for Urban Policy Research, & The National Center for Smart Growth and Policy Research. (2006, June). Infill Development Standards and Policy Guide. Retrieved from http://www.nj.gov/state/planning/docs/infillstandards060106.pdf

Congress for the New Urbanism. (2001). Charter of the New Urbanism. Retrieved from

http://www.cnu.org/charter.

Cooper, Mary H. 2004. Can Managed Growth Reduce Sprawl? Congressional Quarterly Researcher, 14(20): 469-492.

Cutsinger, J., Galster, G., Wolman, H., Hanson, R., and Towns, D. 2005. “Verifying the Multi-Dimensional Nature of Metropolitan Land Use: Advancing the Understanding and Measurement of Sprawl.” Journal of Urban Affairs 27, 235–259.

Dunham-Jones, E., & Williamson, J. (2010, September 7). Downsizing and Retrofitting the Housing Market - Room for Debate. New York Times. Retrieved from http://www.nytimes.com/roomfordebate/2010/09/07/redefining-home-in-a-depressed-market/downsizing-and-retrofitting-the-housing-market

Environmental Protection Agency. (2011, November). HUD-DOT-EPA Partnership for Sustainable Communities. Retrieved November 11, 2011, from http://www.epa.gov/smartgrowth/partnership/index.html

Ewing, R., Pendall, R., and Chen, D. 2002a. Measuring Sprawl and Its Impact . Washington, DC: Smart Growth America.

Felt, E., & Fellowship Program for Emerging Leaders in Community and Economic Development. (2007). Patching the fabric of the neighborhood: The practical challenges of infill housing development for CDCs. Cambridge, Mass.: Joint Center for Housing Studies of Harvard University ; NeighborWorks America.

Fisher, J. D. M., & Gervais, M. (January 01, 2011). Why has Homeownership Fallen Among the Young?. International Economic Review, 52, 3.

Galster, G., Hanson, R., Ratcliffe, M. R., Wolman, H., Coleman, S., and Freihage, J. 2001. "Wrestling Sprawl to the Ground: Defining and Measuring an Elusive Concept." Housing Policy Debate 12, 681–717.

Housing and Urban Development Department. (2012, Janurary). U.S. Housing Market Conditions: 4th Quarter 2011.

Hur, S. (2012). The lost generation of the great recession. Federal Reserve Bank of Minneapolis, University of Minnesota.

Hurd, M. D., Rohwedder, S., & National Bureau of Economic Research. (2010). Effects of the financial crisis and great recession on American households. Cambridge, Mass: National Bureau of Economic Research.

Jaret, C., Ghadge, R., Reid, L. W., & Adelman, R. (2009, March). The Measurement of Suburban Sprawl: An Evaluation. City & Community, 8(1), 65-84.

Jacobs, J. (1961). The death and life of great American cities. New York: Random House.

Katz, B. (2011, April 13). Beyond the Recession: The Great Housing Rebalance. Keynote Speech presented at Brookings Metropolitan Policy Program.

Kemp, R. L. (2011, April/May). The "American Dream" Moves Downtown. The Futurist, 45(2), 6.

Koppen, J. (2009). Effect of the Economy on Housing Choices. Washington D.C.: AARP.

Leinberger, C. (January 09, 2008). Interview by K NNamdi [Personal Interview]. Walkable urbanism is changing city life. National Public Radio, Washington, DC. , Retrieved from http://www.brookings.edu/interviews/2008/0109_walkableurbanism_leinberger.aspx

McConnell, V. D., & Wiley, K. (2010). Infill Development: Perspectives and Evidence from Economics and Planning (RFF Discussion Paper 10-13). Resources for the Future. Retrieved from http://www.rff.org/Publications/Pages/PublicationDetails.aspx?PublicationID=21176

McDonald, R., Forman, R., & Kareiva, P. (2010, February). Open Space Loss and Land Inequality in United States' Cities 1990-2000. PLoS ONE, 5(3). doi:10.1371/journal.pone.0009509

McIlwain, J. (2010). Housing in America: The Next Decade (The Urban Land Institute, Ed.) (Rep. No.H10).

Medina, J., & Tavernise, S. (2011, October 27). Economy Alters how American are Moving. The New York Times. Retrieved from http://www.nytimes.com/2011/10/28/us/americans-migration-patterns-shifting.html

Municipal Research and Services Center of Washington (MRSC). 1997. Infill development strategies for shaping livable neighborhoods. Report no. 38. http://www.mrsc.org/Publications/textfill.aspx.

Myers, D., & Gearin, E. (January 01, 2001). Current Preferences and Future Demand for Denser Residential Environments. Housing Policy Debate, 12, 663.

Myers, D., & Pitkin, J. (2009). Demographic Forces and Turning Points in the American City, 1950-2040. The ANNALS of the American Academy of Political and Social Science, 626(1), 91 -111. doi:10.1177/0002716209344838

PolicyLink. (2002, March). Infill Incentives. Retrieved from http://www.policylink.org/site/

c.lkIXLbMNJrE/b.5137445/k.A34D/Infill_Incentives.htm

Rohe, W. M., & Watson, H. L. (2007). Chasing the American dream: New perspectives on affordable homeownership. Ithaca: Cornell University Press.

Rybzczynski, W. (2011). Dense, Denser, Densest. Wilson Quarterly, 35(2), 46-50. Retrieved from EBSCOhost.

Tsai, Y.H. (January 01, 2005). Quantifying urban form: compactness versus 'sprawl'. Urban Studies, 42.

U.S. Environmental Protection Agency. (January, 2010). Residential Construction Trends in America's Metropolitan Regions (Development, Community, and Environment Division, Ed.).

Volk, L., & Zimmerman, T. (2011, June 27). A Radical Re-alignment. New York Times. Retrieved from http://www.nytimes.com/roomfordebate/2010/09/07/redefining-home-in-a-depressed-market/a-radical-re-alignment-in-housing

Wegmann, J., & Nemirow, A. (2011, February). Secondary Units and Urban Infill: A Literature Review (University of California at Berkeley, Ed.). Institute of Urban Regional Development.